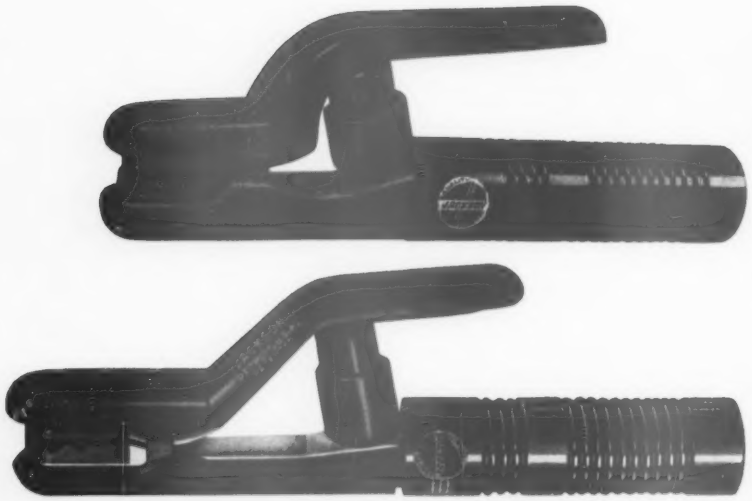
THE WELDING ENGINEER

APRIL, 1954

A McGRAW-HILL PUBLICATION • 35 CENTS



MODEL
A-W
for electrodes
1/16 thru 1/4"
14
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21
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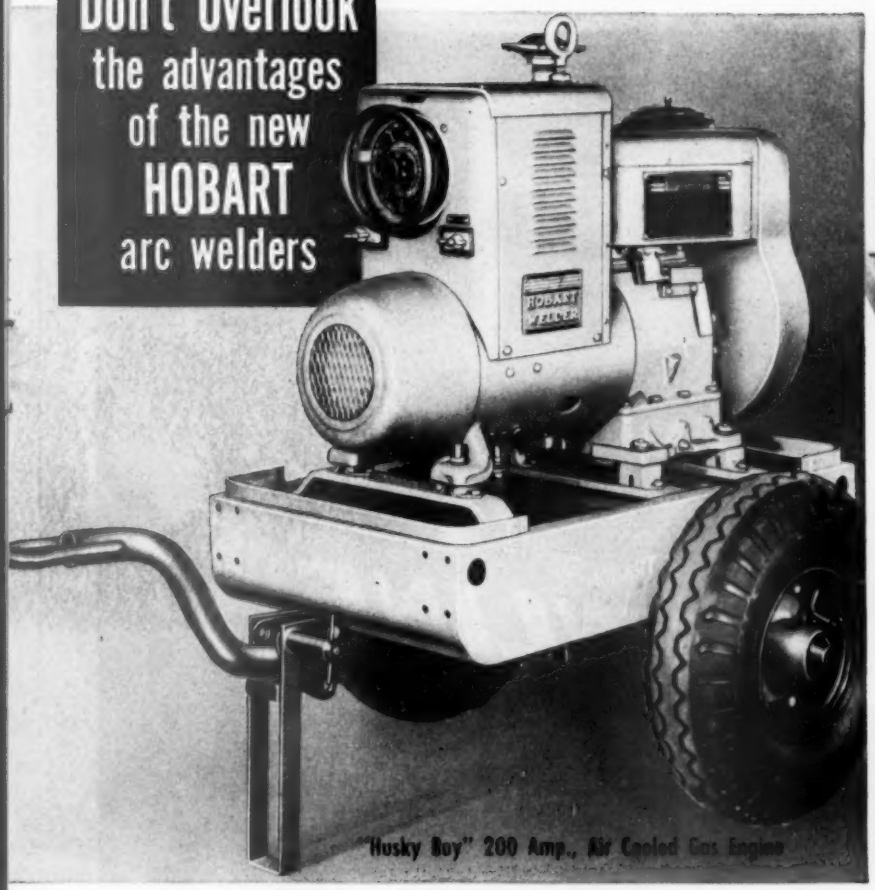

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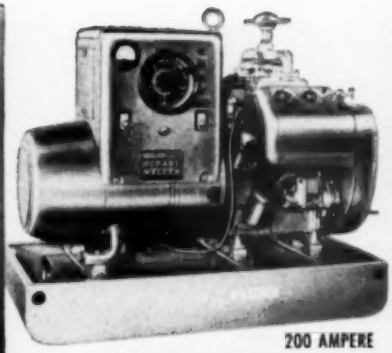
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AC Welder—AC Power Combination

Now, you can have AC WELDING and AC POWER

. . . FOR THOSE "BIG PAY" outside repair jobs. Furnishes emergency power for electric lights . . . operates power tools, motors, etc.

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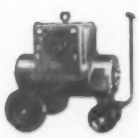
HOBART BROTHERS COMPANY, BOX U-44, TROY, OHIO, PHONE 21223

"One of the world's largest builders of arc welders"

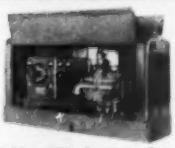
HOBART TROY OHIO WELDERS

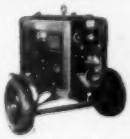
{ a size and type for every welding requirement


300 Amp. Electric Drive

300 Amp. Gas Engine Drive

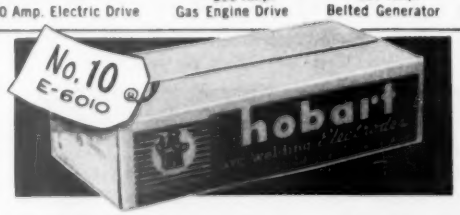
200 Amp. Belted Generator


Welder with Auxiliary Power


Pipeliner Welder

A. C. Welder—AC Power Combination

Hobart Weldmobile



A better general-purpose electrode

Right down to the stub a Hobart "10" electrode gives more welding ease and efficiency. An all-position DC electrode, it has a stable, deeply penetrating arc . . . deposits a smooth, flat bead of high tensile strength and ductility. Send for free samples.

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Please send information on the items checked below:

☐ "Husky Boy" ☐ AC Welding—AC Power ☐ Transformer Type AC Welder ☐ Hobart Electrode Samples (Other)_____

Name_____ Position_____

Firm_____

Address_____

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4027 stock items
You can plan for economical, efficient butt-welded corrosion piping with assurance of quick availability of FLOWLINE Fittings. Delivery can be made from stock by leading distributors. Made in sizes ½" through 12" — Schedules 5S, 10S, 40S, 80S — Stainless Types 304, 304L, 316, 347; Monel, Nickel, Aluminum. Seamless fittings with all the plus values . . . at no extra cost.
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THE WELDING ENGINEER

A McGRAW-HILL PUBLICATION

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VOLUME 39 NUMBER 4

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VICTOR for welding

Profitable dealerships open; inquire now!

For Manual Application

THIS HARD-FACING ROD	FOR THESE CONDITIONS	FOR THIS EQUIPMENT	APPLI-CATION
VICTORTUBE	Severe abrasion	Scarifier teeth, dredge cutter blades, posthole augers, oil field tools, ditcher teeth	Acety. AC-DC Elec.
VICTORTUBE "SPECIAL"	Abrasion, severe impact	Oilfield bits, rock bits	Acety. only
VICTOR TUNGSMOOTH	Thin cutting edges	Coal cutters, brick augers, pug mill knives, screw conveyors, farm tools	Acety. AC-DC Elec.
VICTORITE	Earth abrasion or sliding friction	Plowshares, cultivators, steel mill guides, cement chutes, shaft bearings, rolling mill guides	Acety. AC-DC Elec.
TUBE VICTORITE	Abrasion, impact	Plow points and farm tools	Acety. AC-DC Elec.
VICTORITE 1	Corrosion, heat, abrasion	Saw teeth, carbon scrapers, wire guides, rocker arms, steel mill applications	Acety. AC-DC Elec.
VICTORITE 6	Red heat, impact, corrosion and abrasion	Blanking, forming and trimming dies, cams, hot punches, pump shafts	Acety. AC-DC Elec.
VICTORITE 12	Heat, abrasion, impact	Saw blade inserts and other critical applications	Acety. AC-DC Elec.
VICTORITE CARBON ARC	High abrasion, thin deposit	Plowshares, lister shares, sweeps	Carb. arc Acety.
VICTORALLOY	Abrasion, severe impact	Tractor rollers, dredge pump impellers, bucket lips and teeth, rock crushers, steel mill wobblers, roll crushers	Acety. AC-DC Elec.
VICTORALLOY #1	High abrasion, medium impact	Bucket lips, rock crushers, Muller tires, gyratories	Acety. AC-DC Elec.
VICTORALLOY "A"	Angular shock, extreme impact, build-up	Clutch parts, gears, crusher plates, gyratory mantles, build-up for hardfacing	AC-DC Elec. only
VICTORALLOY "B"	Heavy impact, moderate abrasion	Tractor rollers and sprockets, shovel pads, plates, idlers, etc.	AC-DC Elec. only
VICTORALLOY "C"	High abrasion, moderate shock and impact	Tractor grousers, pressure rolls, crusher segments, roll crusher teeth	AC-DC Elec. only

Also VICTOR Bulk Metals, VICTORITE Plow Point Bars, and VICTOR Super-Titan Blasting Nozzles

For Automatic Application

THIS TYPE	FOR THESE CONDITIONS	ON THIS KIND OF EQUIPMENT
VA #1	Abrasion, medium impact	Crusher rolls, crushers, gyratory crushers
VA #2	Abrasion, impact, Multi-pass application	Steel mill applications
VA #3	Abrasion, light impact	Mill guides, crushers, dredge bushings
VA #4	Multiple layer build-up	Tractor rails, crane wheels, general build-up
VA #5	Heavy impact, abrasion	Tractor rollers, idlers, mine car wheels, sheave wheels
VA #6	Medium abrasion, high impact	Crane wheels, drums, roll necks
VA #7	Abrasion, high impact	Build-up for hardfacing
VA #8	Abrasion, medium impact	Dozer bits, roll crushers, scraper blades
VT #60	Extreme abrasion	Tool joints, grader blades, scraper blades, augers

VICTOR EQUIPMENT COMPANY

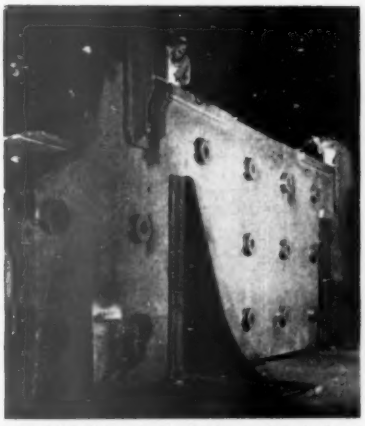
ALLOY ROD AND METAL DIVISION

11440 So. Alameda St. · Los Angeles 59

(Also Mfrs. of welding & cutting equipment, blasting nozzles)

844 Folsom St., San Francisco 7 3821 Santa Fe Ave., Los Angeles 58

H-11



WELDORS at Bethlehem Steel Co. attach pads to crosshead support for huge forging press destined for Air Force. Also welded were 22 bosses to each side of support

STANDING next to van that is carrying equipment on tour of 18 cities are (from left) W. R. Stevens, welding division sales manager; Henry Harnischfeger, executive vice-president; M. O. Monsler, general manager of the welding division; Bernie Germischausen, who is in charge of the welding show; and Lyle Prodell, driver of the van. (See story below)

NEWS

39 Papers Scheduled for AWS Buffalo Meeting

VARIOUS aspects of welding will be covered in the 39 papers scheduled to be read at the spring meeting of the American Welding Society. The national meeting will be held May 4 through 7 at the Hotel Statler, Buffalo.

Major topics to be covered are weldability, inert-arc welding, resistance welding, welding of stainless steel; surfacing and metallizing, welding of titanium, structural welding, processes and equipment, non-ferrous metals, piping and tubing and welding applications.

In conjunction with the meeting, the Society will hold its second welding show in the Memorial Auditorium on May 5-7. A recent partial list of exhibitors showed that about 90 firms had been allocated booth space.

* * *

Film on Welding Procedures Produced by Eutectic

WELDING rod and electrode techniques and procedures are depicted in a full-color sound movie entitled "New Welding Procedures," which was recently released by Eutectic Welding Alloys Corp., Flushing, N. Y.

The 19-minute film includes samples of arc welding in which the principle of "surface alloying" has been incorporated to reduce the heat input to a minimum. It is strictly a technical motion picture and is said to contain no promotional or advertising material.

* * *

Metal & Thermit Opens Atlanta Office

To serve its customers in the southeastern part of the country, Metal & Thermit Corp., New York City, has opened a district office in Atlanta, Ga. Claude Davis, Jr., is in charge of the office, which is located at 762 Stewart Ave., S.W.

Close at Hand

April 7-9: International Acetylene Association, 54th annual convention, Palmer House Hotel, Chicago.

May 4-7: American Welding Society, spring technical meeting, Hotel Statler, Buffalo.

May 5-7: Welding and Allied Industry Exposition, Memorial Auditorium, Buffalo.

May 19-21: American Institute of Electrical Engineers and American Welding Society, fourth conference on electric welding, Hotel Schroeder, Milwaukee.

Harnischfeger Exhibit Touring 18 Cities

ITS new line of welding machines is being demonstrated by the Harnischfeger Corp., Milwaukee, through means of a traveling exhibit, which has 18 major cities on its itinerary. A large van (pictured above) is transporting the equipment, which has already been shown in Milwaukee, Detroit, Cleveland, Pittsburgh, Boston and New York.

Still on the schedule are Philadelphia, April 8; Chicago, April 22; St. Louis, April 29; Birmingham, May 6; Houston, May 13; Dallas, May 20; Phoenix, May 26; Los Angeles, June 3; San Francisco, June 10; Portland, June 17; Seattle, June 24; Salt Lake City, July 1.

Among the welders being displayed is the "DA-200," which provides either a-c or d-c current simply by throwing a switch. A 400-amp, d-c, rectifier welder ("D-400") and two new gasoline-driven arc welders ("WN-150" and "WN-250") are also being shown. In addition to these and other welders, the exhibit includes several new types of iron-powder-coated electrodes and a positioner.

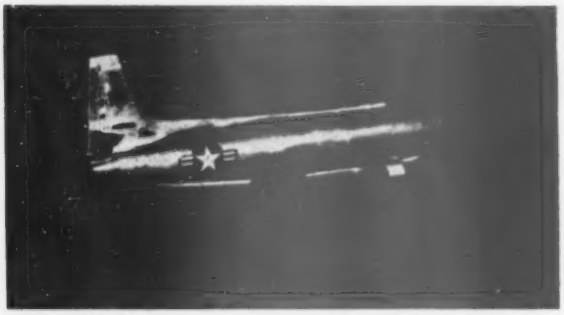
* * *

Government Reduces Copper Reserves

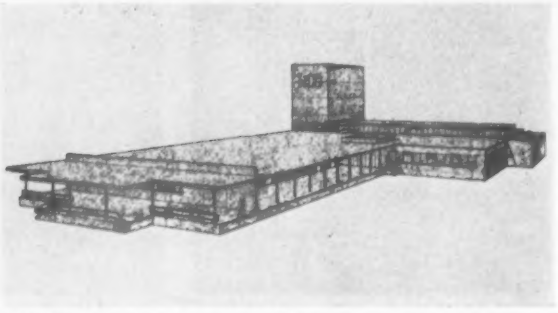
IN LINE with its policy of relaxing controls over materials, the Business and Defense Services Administration recently announced an amendment to Order M-11A. The amendment reduces further the percentage of copper and copper-base alloys that producers are required to reserve for filling military and atomic energy rated orders.

NEWS

from page 5



WORLD'S fastest plane has sections that are welded



LIQUID-oxygen plant is under construction in Chicago

Welded Tanks Used on Rocket-Powered Plane

WELDING was employed in the fabrication of two complicated sections of the Bell X-1A, said to be the world's fastest airplane. The sections consist of large tanks that are part of the rocket-powered plane's fuselage. One of the tanks contains alcohol, the other liquid oxygen.

The craft is a flying laboratory that is being used to investigate the aerodynamic effects of supersonic flight. It is not intended as a tactical airplane. This Air Force plane recently set a speed record of more than 1,600 mph.

Welding and heat-treating problems on the two sections were worked out by Bell Aircraft and engineers of Aluminum Co. of America. Alcoa fabricated the two sections at its jobbing division, New Kensington, Pa.

* * *

Acetogen Company Formed in New York City

"ACETOGEN" gas for metal cutting, brazing and silver soldering has been made available in New York City and the surrounding area with the establishment of Acetogen Cutting Gas Co., Inc. The company has been formed by Robert D. Fier and Herbert A. Frankel. Its address is 26 Court St., Brooklyn 1, N. Y.

* * *

Plan Research Plant for Resistance Welding

CONVINCED that the resistance-welding industry, despite its recent growth, is hampered by a lack of technical information, Sciaky Bros., Inc., Chicago, is planning a new research plant on the Pacific Coast. Announcement of the opening is expected shortly.

Object of the plant: fundamental research on resistance welding of all metals and eventually a thorough exploration of design considerations.

* * *

New Wisconsin Welding Firm

A FIRM known as Interstate Welding Sales Corp. has been incorporated in Marinette, Wis. Incorporation papers were signed by Eugene E. Hart, 1801 Marinette Ave., Marinette.

* * *

Morgan Moves to New Site in Cleveland

THE Morgan Aluminum Welding Rod Co. was to have moved last month to a new building at 17706 Miles Ave., Cleveland 28, according to an announcement by James E. Norcross, president. The firm's former address was 6700 Morgan Ave., Cleveland 27.

The new space is larger, completely modern and equipped to produce a complete line of aluminum welding rods, layer-wound spooled wire and electrodes.

* * *

Hungary Introduces Domestic Electrode

A REPORT from Vienna states that annual savings of 1,000,000 forints ($114,400) in imports will be realized in Hungary through the introduction of a new welding electrode. That country's Iron Industry Research Institute has worked out a new type of electrode with a so-called "bazik" coating. It is expected to replace the 2.5-mm imported electrodes, which are used in welding steel plate.

The new product is made from raw materials that are domestically available. It may be used even in gas welding.

—McGraw-Hill World News

NCG Building Its First Liquid-Oxygen Plant

CONSTRUCTION of a $3,500,000 plant for the manufacture and distribution of liquid oxygen has been announced by National Cylinder Gas Co., Chicago. The plant will be built on an eight-acre site on Chicago's south side. A portion of the liquid oxygen to be produced at the new site will be gasified and placed in cylinders for customers using oxygen in this form.

Meanwhile, the company announced that it has placed in operation a new oxygen plant in Tampa, Fla. This brings to 55 the number of oxygen plants it has located throughout the United States and in Canada, Colombia and Venezuela. The firm also operates 37 acetylene plants.

* * *

Sales Office in Houston Opened by Fansteel

A REGIONAL sales office in Houston, Texas, was opened last month by Fansteel Metallurgical Corp., North Chicago, Ill. Located at 2801 San Jacinto St., the office will serve Texas and Louisiana and will be managed by Lawrence C. Rodgers.

A. V. Doran, who has been covering the two-state area from the firm's St. Louis office, has been appointed southwestern district manager.

* * *

New York Chapter of AWS Starts Long Island Division

THE New York Chapter of the American Welding Society recently organized a Long Island division. The organizational conference was held at the Farmingdale, N. Y., plant of the Fairchild Engine and Airplane Corp. Representatives of Long Island industries attended the meeting.

(More News on page 83)

nothing to stop you . . .

look — its sturdy, smooth, safely silver soldered tubes glide effortlessly through the operator's guiding hand. No obstructing coupling nut or tube joint hinders good performance, suggests the possibility of dangerous gas leaks. So many outstanding, modern and economy producing advantages have been incorporated into NATIONAL flame cutting torches that you, too, will find it to your interest and profit to write for the now rather famous brochure . . .

it's free, write today

"flame cutting—here's how it works"

it's made by

National of . . . california

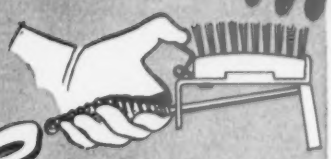
NATIONAL welding equipment company... 218 fremont street san francisco 5 california

ATLAS "DUAL TOOLS"

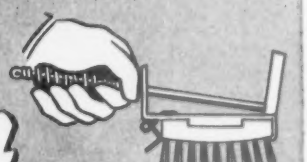
NEW DESIGN MAKES THEM BETTER 6 WAYS

1 Chip and brush with one tool

2 Better brush angle— No bruised knuckles



3 Easier brush removal for reversing or changing



4 Guard protects fingers

5 Stronger, more rugged ribbed frame

6 Handle clearance makes them easier to pick up.

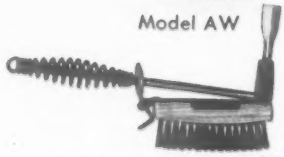
Patents Pending

Model A

MADE IN 4 MODELS

STRONGER, EASIER TO USE!

Model AW



Typical Atlas ruggedness and quality are built into these re-designed weld cleaning tools to make them doubly important in improving quality and volume of production.

"Re-bit" Model B-1

Welders like their balance and "feel"—will like these new models better than ever.

"Re-bit" Model B-1W

See all 27 Atlas models at your Welding Supply Dealers

ATLAS PROVED PRACTICAL WELDING ACCESSORIES

Atlas WELDING ACCESSORIES CO.

707 E. LEWISTON AVENUE FERNDALE 20, (DETROIT) MICH.

"Don't scrap it . . . braze-weld it" paid off handsomely when this inner ram was twice repaired.

Braze welds twice save press part from scrap heap

This is the inner ram of a 500-ton press for shaping automobile fenders, quarter panels, floors, etc. It weighs 10 tons.

Twice it cracked, in different places. And twice braze-welding repaired it. It would have cost thousands of dollars to replace this part.

Punch Press Repair Corp., 1975 Hilton Road, Ferndale 20, Michigan, did both jobs. Each time they used Tobin Bronze*-481 Welding Rods. They say, "Welding with Tobin Bronze saves us time. It's economical and dependable, too. Braze welds need less preheating . . . high stresses don't build up. Tobin Bronze flows freely, 'tins' quickly, gives strong, sound bonds."

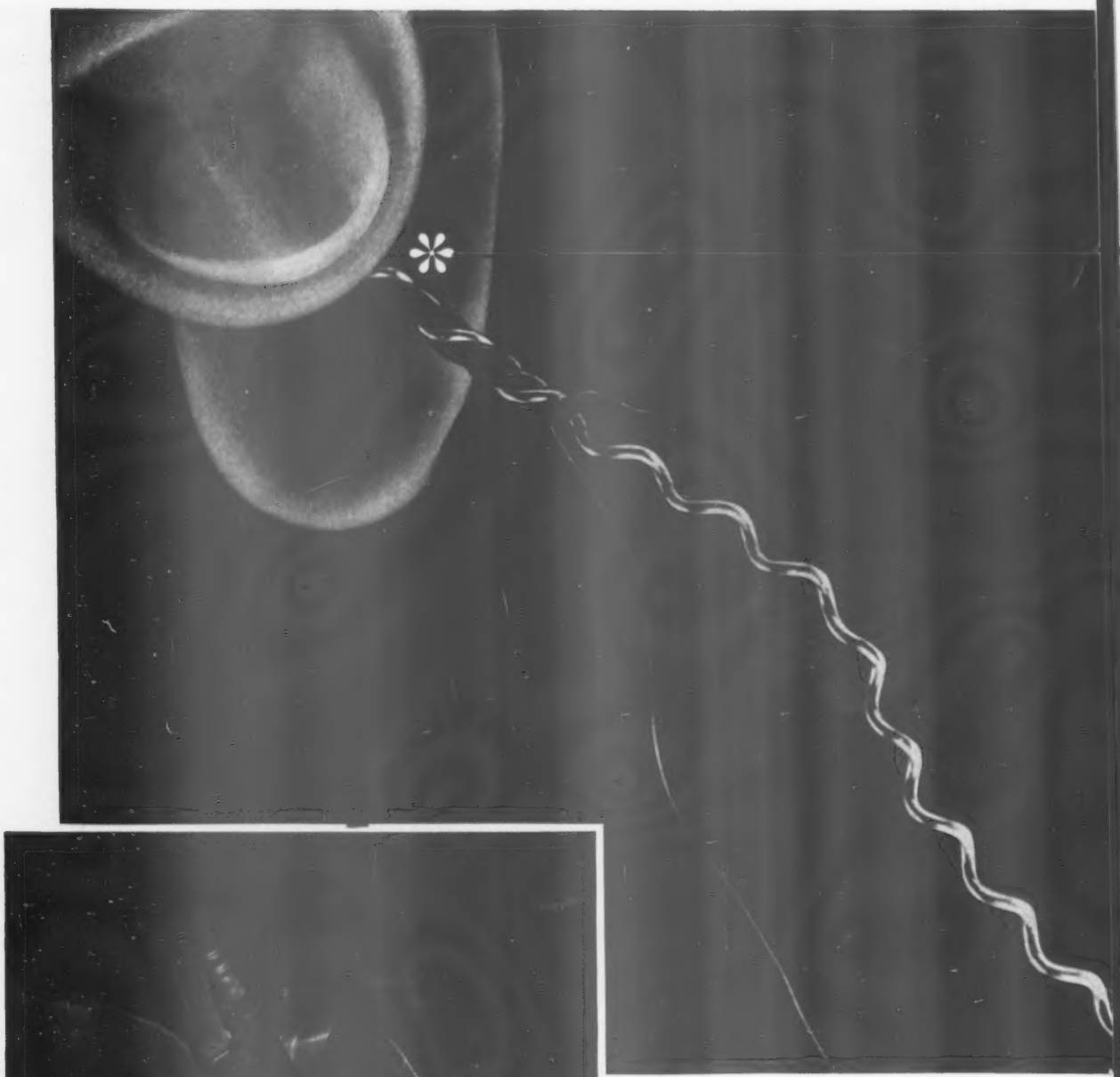
Tobin Bronze-481 Welding Rod is widely used for repair welding of cylinders and other locomotive parts . . . automobile engine blocks . . . cast-iron pipe . . . machinery parts and other equipment.

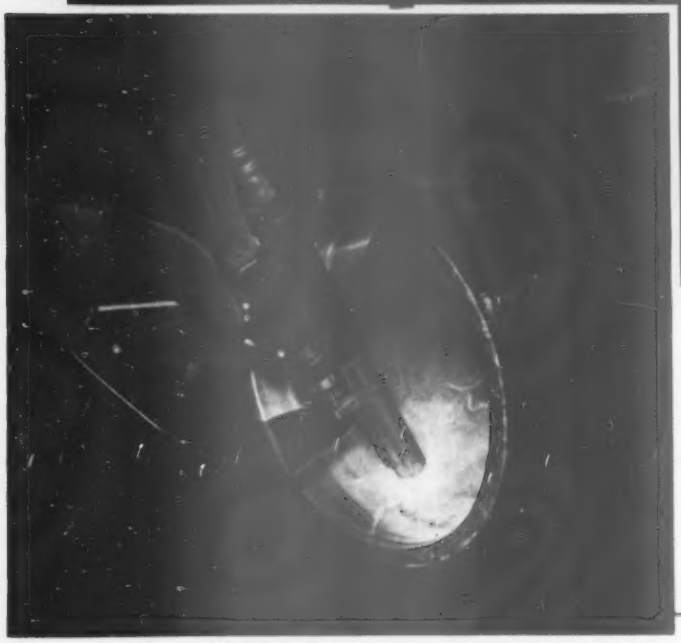
ANACONDA Welding Rods for *many* types of repair and production jobs are available from distributors throughout the United States. *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

*Reg. U. S. Pat. Off. 54137

ANACONDA®
welding rods

AnacondA Copper-372 • Tobin Bronze-481 • AnacondA-997 (Low Fuming) Bronze • Nickel Silver-828 • Cupro Nickel-826 • Everdur-1010 • Ambraloy-928 • Phosphor Bronze-351 • Phosphor Bronze-354





An overlay ⅛" thick and 2" wide being deposited in the confined area of a 10"-diameter steel cylinder. Actual welding takes about twenty minutes.

The problem of depositing special alloys that are hard to draw and spool for use with the Aircomatic process is neatly answered by the use of stranded wire, an Airco development. In the wire used for these aluminum-bronze overlays, two strands of copper and one of aluminum are wound around a fine iron core. Melted by the arc, the component metals mix and alloy themselves into aluminum bronze of the correct analysis.

AIRCO®

New Idea in Welding

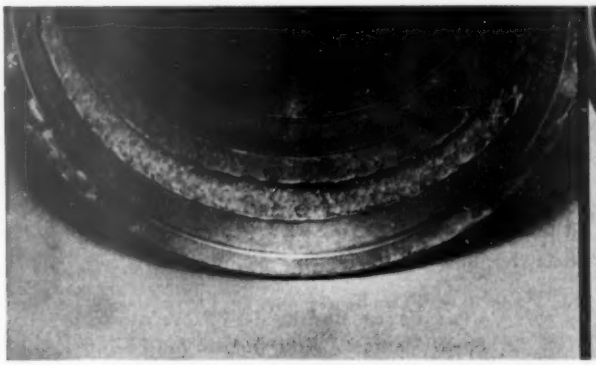
NEW STRAND-ALLOY "WIRE" DEVELOPED BY AIRCO OPENS WHOLE NEW FIELD OF APPLICATIONS FOR INERT-GAS-SHIELDED WELDING

Now, a completely new development, a stranded multi-metal filler wire, has opened the door to the welding of aluminum bronzes with the Aircomatic Process. This type of electrode is the answer where certain desirable compositions are impractical to draw down to small diameter wires and to coil on spools.

Manufacturers are using the new wire successfully, with remarkable increases in speed, ease and weld quality that Aircomatic has consistently shown in depositing more ductile materials. A typical report comes from National Rubber Machinery Company, Clifton, N. J. The National job involved aluminum-bronze overlays on piston recoil sleeves for tank guns. Before Airco introduced the new stranded wire, National Rubber Machinery had to use conventional "stick" electrodes. The new wire and Aircomatic welding cut production time to less than one-third what it was with the old method! Moreover, each sleeve took only 2½ pounds of wire, in contrast to six pounds of coated electrodes.

Airco now offers three types of stranded aluminum-bronze electrode wire, and one lead-tin-copper bearing alloy wire.

For details of this and other applications of Airco's amazingly fast and effective Aircomatic process, write your local Airco office today.



Close-up of the finished aluminum-bronze overlay before machining. Note the smooth beads and the absence of spatter.

After machining, the overlay looks like this. Aircomatic's concentrated heat input produces excellent fusion.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AIR REDUCTION

AN AIR REDUCTION PRODUCT

60 East 42nd Street • New York 17, N. Y.

Air Reduction Sales Co. • Air Reduction Magnolia Co. • Air Reduction Pacific Co.
Represented Internationally by Airco Company International
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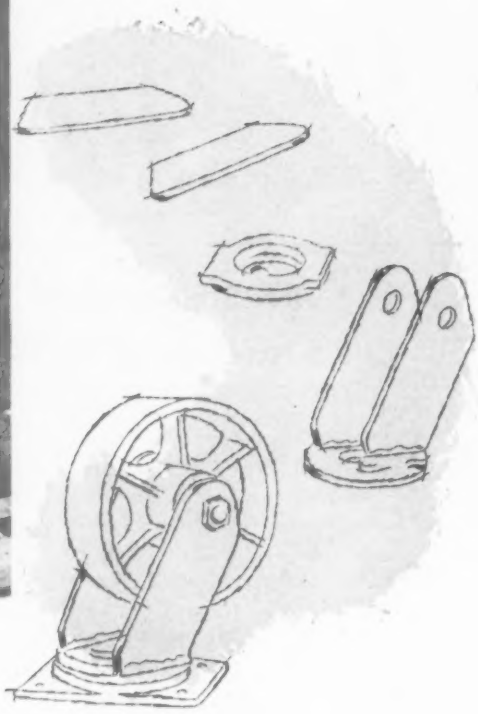

SIGMA WELDING BOOSTS STEEL FABRICATION 100%

A manufacturer of steel truck casters, has doubled his production from 400 to 800 units a day— by changing to sigma welding.

Average welding speed is 120 in. per minute—Once clamped, the parts are welded in less than ½ minute.

Used as welded—Free from spatter and flux entrapment, the need for finishing is eliminated.

Cut costs—Fewer production steps have made possible labor savings up to ½ the former costs.

Sigma welding is just one of the welding processes developed by LINDE's research and years of experience. HELIARC, sigma, and UNIONMELT welding form a top notch fabricating team which is now setting a new peak in industrial production. For small shops or huge production lines, from carbon steel to complex alloys and non-ferrous metals—there is a LINDE electric welding process to do the job efficiently and economically. Your local Linde representative will help you determine the best welding process for your job. Call him today for more information.

Visit us at Booths 70-77 Welding Show Memorial Aud. Buffalo May 5-7

Linde
TRADE-MARK

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
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In Canada: DOMINION OXYGEN COMPANY
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NEW PENOPTIC MODEL 900

A Cup-Type Safety Goggle that meets Federal Specifications!

The introduction of Penoptic's new "900" was preceded by months of analytical research which determined the selection of materials and the comfort features of the design. The result . . . a smooth, contour-fitted, well-ventilated cup goggle is now ready for your inspection. The "900" offers new comfort, absolute "any angle" protection and immediate worker acceptance at lower cost through Penoptic's manufacturer-to-you distribution policy. For prices and full information, write directly to Pennsylvania Optical Company, Reading, Pa. or 1712 Taraval Street, San Francisco 16, Cal.

- Durable Plastic Cups
- Aluminum Lens Retaining Rings
- Standard 50mm Safety Lenses
- Molded Rubber Headband
- Three-Way Ventilation
- Wide-Angle Vision

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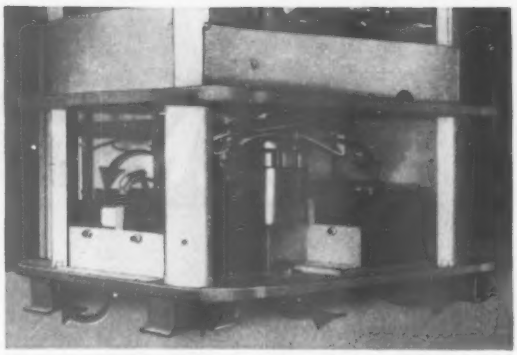
WELDING ARCS NEWS

SINGLE-SCALE, DUAL-RANGE current indicator makes it easy to set and check current. Safety cover over terminals can be lifted by hand, is self-closing. Welder can be supplied either for 2-phase or 3-phase power supply.



REVERSIBLE VENTILATING FAN above rectifier stacks of unit is used to blow dust from rectifiers and transformer to prolong rectifier life.

FULL-TIME ARC FORCE CONTROL is turned on by toggle switch. It effectively minimizes stubbing and freezing-in on tough jobs at high speed.

Announcing — the first of a new line of powerful G-E rectifier welders

New 400-amp General Electric rectifier set includes new features for longer life and improved performance

Now, before you buy any d-c welder, be sure to try the 400-amp General Electric rectifier welder—first of a new line to be introduced this year.

Here's a d-c welder that lives up to the General Electric reputation for long-life dependability. And it's a full-fledged 400-amp unit, fully capable of short-time 500-amp output.

CHECK THESE G-E ENGINEERED USER BENEFITS

Easy Operation—instant starts plus easy, precise current-control please operators, improve work.

High Production—stable arc permits higher speeds; quiet operation reduces fatigue, boosts output.

Long Life—due to lack of moving parts (except fan), silicone insulation, advanced-design ventilation.

Low Operating Costs—high efficiency and low idle-time power consumption cut power bills; easy-access design-speeds inspection and maintenance.

TWO EXCLUSIVE MONEY-SAVING FEATURES

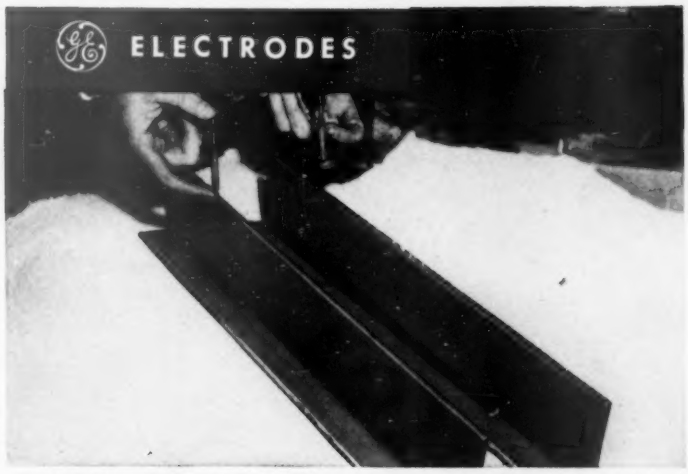
These exclusive features solve user problems:

Reverse-draft Fan—the powerful ventilating fan can be reversed to blow dirt off rectifiers and transformers. This cleaning action minimizes a major cause of rectifier failure.

Full-time Arc Force Control—available as optional equipment—lets you hold a short arc on those extra-tough welding jobs with little chance for popouts or freezing-in.

CONTACT YOUR G-E DISTRIBUTOR TODAY!

For full data on the new G-E 400-amp rectifier welder, contact your G-E Welding Distributor today. He's listed here and in the yellow pages of your phone book under "Welding Equipment—General Electric." General Electric Co., Schenectady 5, N. Y. 710-16



SEE THE DIFFERENCE! New G-E contact electrode produced 19" of fillet in 88 sec. E-6020 rod produced an 8" of fillet in 75 sec. Both tests used 3/16" electrodes on 1/4" mild steel using 230 amps DC.

New G-E Strikeasy 1 electrode for high-speed contact welding

Actual comparison tests indicate that G.E.'s new Strikeasy 1 contact-type electrode produces significantly more weld footage in a given time than high-quality E-6012 and E-6020 electrodes. This high speed can save you as much as 35% in total welding costs.

The new Strikeasy 1 electrode has a rutile coating enriched with powdered iron. This iron melts to form part of the weld bead, greatly increasing the rate of metal deposit. The new G-E electrode operates on AC or DC and is available in 1/8", 5/32", 3/16", 7/32", and 1/4" sizes.

WIDELY APPLICABLE

The Strikeasy 1 electrode is for certain mild-steel and low-alloy welding where you would normally consider an E-6012 or E-6020 rod. Typical uses include low-pressure storage tanks, machine bases, and light structural work.

OTHER PERFORMANCE BENEFITS

- **Less Spatter**—as much as 80% less, a real saving in material.
- **Self-cleaning**—no need to hammer and chisel to remove scale.

POWDERED IRON in coating of new G-E Strikeasy 1 electrode increases metal deposit rate.

- **Easy-to-use**—operates smoothly, minimizes d-c arc blow, reduces operator fatigue.

Contact your nearby G-E Welding Distributor today for samples of the Strikeasy 1 electrode.

You'll Find the Best Electrode for Your Job in the G-E Line—Most Complete in the Industry

G-E WELDING DISTRIBUTORS

Alabama: Birmingham—Alabama Oxygen, Young & Vann Supply; Mobile—Turner Supply

Arizona: Phoenix—Consolidated Welding Supply

California: Fresno, Los Angeles, Oakland, Sacramento, San Diego, San Francisco, Ventura—Victor Equipment

Colorado: Boulder, Colorado Springs, Denver, Durango, Ft. Collins, Ft. Morgan, Greeley, LaJunta, Longmont, Pueblo, Sterling—Hendrie & Bolthoff

Connecticut: Hartford, New Haven—Harris Sales & Service

Florida: Hollywood—Florida Gas & Chemical

Georgia: Atlanta, Macon—Welding Supply & Service; Augusta—Marks Oxygen; Columbus—Williams Welding Supplies

Idaho: Boise—Olson Manufacturing

Illinois: Chicago, Moline, Marion, Rockford—Machinery & Welder

Indiana: Evansville—Drillmaster Supply; Ft. Wayne, Indianapolis — Sutton-Garten; South Bend — Perry Welding Sales & Service

Iowa: Des Moines—Machinery & Welder

Kansas: Hutchinson—Kapper Supply

Kentucky: Louisville—Reliable Welding; Paducah—Henry A. Petter Supply

Louisiana: Alexandria, Shreveport—Hughes Oxygen; New Orleans—Consolidated Welding Supplies

Maryland: Baltimore—Arcway Equipment

Massachusetts: Boston—New England G-E Welding Sales Division

Michigan: Detroit—Welding Sales & Engineering; Grand Rapids—Miller Welding Supply

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Mississippi: Jackson—Jackson Welding & Supply

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Montana: Billings—Valley Welders Supply; Billings, Bozeman, Cut Bank, Glasgow, Great Falls, Havre, Kalispell, Miles City, Shelby, Sidney, Whitefish—Valley Motor Supply; Butte, Great Falls—Montana Hardware

Nebraska: Lincoln—Lincoln Welding & Supply; Omaha—Baum Iron

New Jersey: Kenilworth—Welding Sales Corp.

New Mexico: Albuquerque—Industrial Supply Co. Hobbs—Western Oxygen; Las Cruces, Silver City—Car Parts Depot, Inc.

New York: Buffalo—Welding Equipment Sales; New York—Welding Sales Corp.; Syracuse—Welding Engineering & Equip.

North Carolina: Charlotte—Dixie Gases; Gastonia—Gastonia Motor Parts

North Dakota: Bismarck, Fargo—Acme Welding Supply

Ohio: Akron, Cincinnati, Cleveland, Columbus, Dayton, Mansfield—Burdett Oxygen; Toledo—Odland Iron Works

Oklahoma: Tulsa—G-E Welding Sales Division

Oregon: Eugene, Portland—J. E. Haseltine; Medford, Portland—Industrial Air Products

Pennsylvania: Allentown, Philadelphia, Pittsburgh—Arcway Equipment

South Carolina: Columbia, Greenville—Welding Gas Products

South Dakota: Deadwood—Hendrie & Bolthoff

Tennessee: Chattanooga, Knoxville, Nashville—Welding Gas Products; Memphis—Delta Oxygen

Texas: Abilene—M&M Welding Supply; Alice, Corpus Christi—Crane Welding Supply; Alpine, El Paso, Marfa, Pecos—Car Parts Depot; Amarillo—Welding Equipment & Supply; Beaumont—Beaumont oxygen; Brownsville, Harlingen—Acetylene Oxygen; Dallas—Hill Equipment & Supply; Houston—G-E Welding Sales Division; Lubbock—Welders Supply of Lubbock; Midland—West Texas Welders Supply; Odessa, Pecos—Western Oxygen; Orange—Marine & Petroleum Supply; Pecos—Welding Supply Co.; Plainview—Plains Welding Supply; San Angelo—Southwestern Welding Supply; Texarkana—Hughes Oxygen; Wichita Falls—Nortex Welding Supply

Utah: Salt Lake City—The Galigher Co.

Washington: Seattle, Spokane—J. E. Haseltine; Spokane, Yakima—Industrial Air Products

West Virginia: Bluefield—Bluefield Supply; Charleston—Virginian Electric; Huntington, Logan—Logan Hardware & Supply

Wisconsin: Milwaukee—Machinery & Welder

Alaska: Anchorage—Northern Supply

Canada: Toronto—Canadian G.E.

Hawaii: Honolulu—American Factors, Ltd.

GENERAL ELECTRIC

For Intermittent Service
You Can't Beat this Welder

You Can't Beat its Price

You Can't Beat its Performance

New P&H TI-295 295-amp AC Welder

America's most complete line of arc-welding equipment and electrodes

P&H AC WELDER

A full range of sizes up to 625 amps (NEMA-rated). All are connectable to 220 or 440 volts. Dial-lectric Instantaneous Remote Control is fingertip control — gives you any heat you want, right at the work.

P&H DC RECTIFIER WELDER

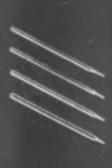
Four sizes — 200, 300, 400 and 500 amps (NEMA-rated). No moving coils to break down — no bearings, brushes, commutator, brush riggings, etc., to replace. Dial-lectric Control gives you fingertip heat-control at the work.

P&H POSITIONERS

One finger is enough to position heavy weldments for economical downhand welding. Capacities from 2500 to 36,000 lbs. — remote-control and hand-operated models.

P&H ELECTRODES

A type and size for every job — to give you cleaner, sounder welds at lower cost on mild steel, cast iron, "hard-to-weld" steels, stainless steels, or hard surfacing.



. . . the only low-cost intermittent-type welder that can handle low-hydrogen and stainless-steel electrodes

Here's another P&H first—a low-cost, low-input welder with all the advantages of a heavy-duty machine — with a rated load and duty cycle as follows: 295 amps 20%; 250 amps 30%; 200 amps 50%.

Wide Range — Just take a look at the current range of this new TI-295. You can't beat it, because you go from 25 amps to 300 amps. That means that you can use this machine on light-gauge material as well as on heavy plate.

No Arc Booster — You get much more than wide current range from this new welder — you get an open-circuit voltage of 75 volts. What does this mean to you? Just this — you can weld with low-hydrogen or stainless-steel electrodes. No other welder that sells for the low price of the TI-295 can do this — can give you such outstanding performance. Moreover, arc striking is made easier and electrode sticking is eliminated.

Exclusive P&H Dial-lectric Control — It's no wonder that you get sound, uniform welds with this machine. All you have to do is turn a radio-like knob with your fingertips and you get exactly the heat you need. The amperage adjustment is creep-proof too, so that when you set the heat it stays there. And changing heat is only a matter of a second or two because a three-quarter turn of the knob is all that's required to go from minimum to maximum capacity.

There is no hard-to-work crank to turn. There are no moving parts — no moving coils or cores, no worm gears or sprockets, chain or lever adjustments. This means there's less wear, less maintenance, *less noise* — nothing to bind or "freeze" from rust.

As we have said before, you can't beat this welder for performance at this price. It's your best welder buy. Contact your P&H representative or distributor — see for yourself how easily the new P&H TI-295 outperforms other welders in this class.

P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4513 W. National Ave. • Milwaukee 46, Wis.

the P&H *Line*

P&H Welding equipment is manufactured and sold in Canada by
REGENT EQUIPMENT MANUFACTURING COMPANY LTD.
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7,980 PHOSON BRAZED JOINTS

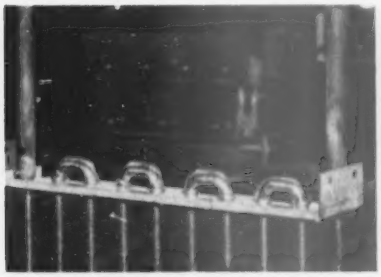
3 REJECTS

Reports **BUSH** *on Refrigeration Coil*

Bush Manufacturing Company, Hartford, Connecticut brazes 24 alloy rings on copper U bends in a continuous chain belt operation through fixed torches. The brazing process is automatic.

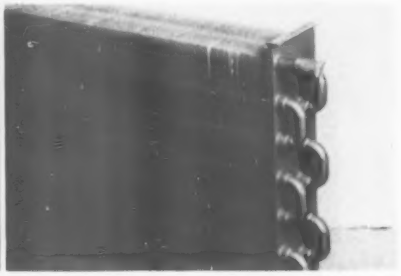
Testing each assembly under 300 pounds of air pressure, Bush reports only *three rejects* in 7,980 joints.

Bush also produces 8 times as many units the STRONG, LOW TEMPERATURE, PHOSON WAY, than with the old torch and rod method.



1. Refrigeration coil U bends shown with PHOSON brazing rings in position ready for production brazing.

2. View of straight line PHOSON brazing operation showing fixed torches and continuous belt action.



3. This is the finished PHOSON brazed refrigeration coil. No further machining or polishing needed . . . a clean, smooth job every time.

GET DEPENDABLE, LOW COST PHOSON IN STRAIGHT LENGTHS, COILS OR PREFORMED RINGS.

NEW PHOSON PERFORMANCE TELLS THE STORY!

CONTACT YOUR NEAREST
UNITED WELDING SUPPLY DISTRIBUTOR
Distributor list on request

DEPENDABLE United WIRE SINCE 1880 BRAZING ALLOYS

ASK FOR NEW PHOSON BOOKLET

See New Color, Sound Movie
"WHEN METALS ARE BRAZED"
Write United Wire for showing date in your city!

UNITED WIRE
AND SUPPLY CORP.
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on welding jobs - large or small,

ARC WELDING EQUIPMENT

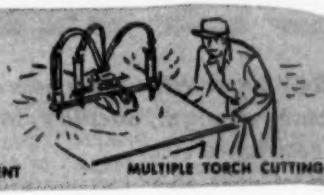
GAS WELDING EQUIPMENT

SPOT WELDING EQUIPMENT

on cutting jobs - one and all,

SHAPE CUTTING EQUIPMENT

FLAME CUTTING EQUIPMENT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SOLDERING AND BRAZING EQUIPMENT

SAFETY EQUIPMENT

ACCESSORIES

BURDOX

at your service - everything to do your job better . . . faster . . . at lowest cost

Today, more than ever, it's important to have the right tools to do your jobs — if you expect to cut time, labor and material costs. When welding or cutting is involved, there's one sure way of getting the correct type of equipment and accessories — call BURDOX! Because we offer all the different methods of doing a job, we know and will recommend the one that will do your work better . . . faster and at lower cost than any other way. Moreover, we can supply the correct accessories for each process and the proper safety equipment to safeguard the worker. BURDOX products cost no more than other types — yet because you can get all your needs from this one source, you will *realize added savings.* Why not make a comparison — call BURDOX on any welding or cutting requirement! Catalog available on request.

BURDOX

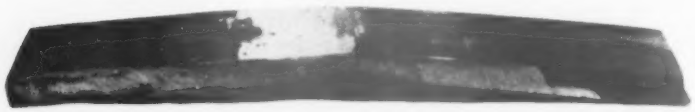
EVERY PRODUCT and EVERY PROCESS TO FIT EVERY PURPOSE BEST...

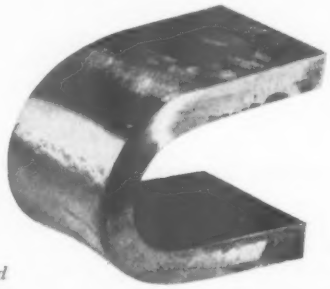
- industrial gases
- gas welding and cutting equipment
- arc welding equipment
- safety equipment

WEAR-ARC "SUPER WH" FOR MANGANESE

WEAR-ARC "Super WH"—the new electrode that combines strength, ductility, impact and abrasion resistance . . .

As a result of more than two years of research development and field tests, the Alloy Rods Company proudly announces Wear-Arc "Super WH" as a truly revolutionary electrode with superior strength and wear properties. The core wire, which is melted especially to Alloy Rods Company specifications, contains approximately 33% alloy . . . balanced in proportions never before conceived in a hard facing electrode. This entirely new alloy has a carbon content of only 0.35% but develops an equivalent hardness of alloy steels containing *three times* this carbon content. Those experienced in the hard facing field will recognize the advantage of a low carbon alloy in preventing spalling and flaking of the weld deposit under operating conditions requiring severe impact. With abrasion resistance *up to four times* over manganese steel, "Super WH", which operates on either AC or DC current, offers a new concept of values in the impact-abrasion hard facing field that will serve as a standard for the future.





(Above) Manganese steel plate welded with 14% manganese electrodes—maximum bend obtainable in free bend test.

(Right) Manganese steel plate welded with WEAR-ARC "Super WH" electrodes—after free bend test.

VISIT US AT BOOTHS 165-169

WELDING SHOW

MEMORIAL AUD. BUFFALO—MAY 5-7

WEAR-ARC "Super WH"—the new electrode that has better physical properties than any other electrode for welding manganese steel . . .

The table shows the amazing physical properties of "Super WH" as compared to heat treated manganese steel plate and the best manganese steel electrode that was available *before* the development of WEAR-ARC "Super WH".

	Weld Metal "SUPER WH"	Weld Metal 14% Mang.	Plate 14% Mang.
Condition of Material Tested	As welded	As welded	Heat treated
Tensile Strength (psi)	130,000-140,000	85,000-90,000	90,000-130,000
Yield Strength (psi)	85,000-90,000	45,000-55,000	45,000-55,000
% Elongation (Free Bend)	40.0%-45.0%	8.0%-15.0%	35.0%-45.0%
Carbon Content	0.35%	0.80%	1.00%
Wear Resistance Factor*	(work hardened) 2.20 to 4.10	(work hardened) 0.86 to 0.93	(work hardened) 1.00
Rockwell C Hardness (Average)			
As Welded	23.5	19.0	16.5
Work Hardened	48.5	47.0	48.0

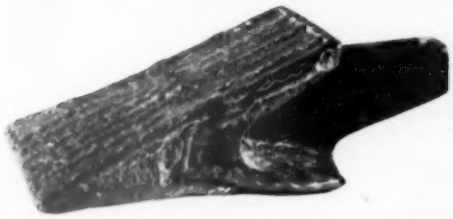
*Ability to resist wear as compared to work hardened manganese plate. Higher figures represent greater resistance to wear.

REVOLUTIONARY *new* ELECTRODE

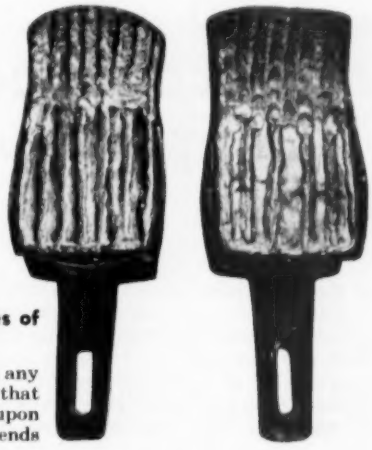
STEEL WELDING

WEAR-ARC "Super WH"—the new electrode that is two electrodes in one for maximum weld strength and maximum wear resistance . . .

Now only one type of electrode is necessary for attachment welding and hard facing. "Super WH" eliminates the necessity of using stainless steel or other types of electrodes for strength welds and manganese steel electrodes for wear resistance. "Super WH" will join manganese to itself or to any other type of steel with greater strength and rigidity than stainless steel and at the same time outwear the weld deposit of any manganese steel electrode *four to one*. Under normal welding conditions, it is impossible to obtain cracks in the root or subsequent passes when using "Super WH". Those who have attempted to use manganese steel electrodes for welding root passes will welcome this great electrode which also outwears any work hardening electrode ever developed.



(Left) A repointer bar has been welded in place on a worn tooth and then the entire area has been resurfaced—"Super WH" electrodes were used for both operations.



(Right) These teeth were subject to the same number of hours of service in handling approximately 12,000 tons of large rock. The worn tooth on the left was welded with 14% manganese electrodes, the one on the right was welded with "Super WH" electrodes.

SPECIAL INTRODUCTORY OFFER... **Now prove the cost-saving advantages of new WEAR-ARC "Super WH"—and do it for just $5.90!**

At this sensational low price we'll send you ten pounds of "Super WH" electrodes (in any one of the three diameters) packed in a hermetically sealed metal container—and that $5.90 includes shipping charges anywhere in the United States. *But act fast*—fill in coupon below and enclose check or money order *today* . . . special introductory offer ends May 15, 1954.

See your Alloy Rods distributor for larger quantities of the new and superior Wear-Arc "Super WH".

Alloy Rods Co.

General Offices and Plant • York, Pennsylvania
Pacific Coast Sales Offices & Plant • El Segundo, Calif.

ARCALOY Stainless Steel Electrodes • BRONZE-ARC Phosphor Bronze Electrodes • NICKEL-ARC Electrodes for Cast Iron • TOOL-ARC Electrodes for Tools and Dies • WEAR-ARC Hard-Facing Electrodes WELD-ARC Low Hydrogen Electrodes

no finer electrodes made...anywhere

Yes, I want to take advantage of your special introductory offer. I enclose $5.90 for a ten pound container of Wear-Arc "Super WH" in the following diameter: ☐ 5/32", ☐ 3/16", ☐ 1/4".

Name.....

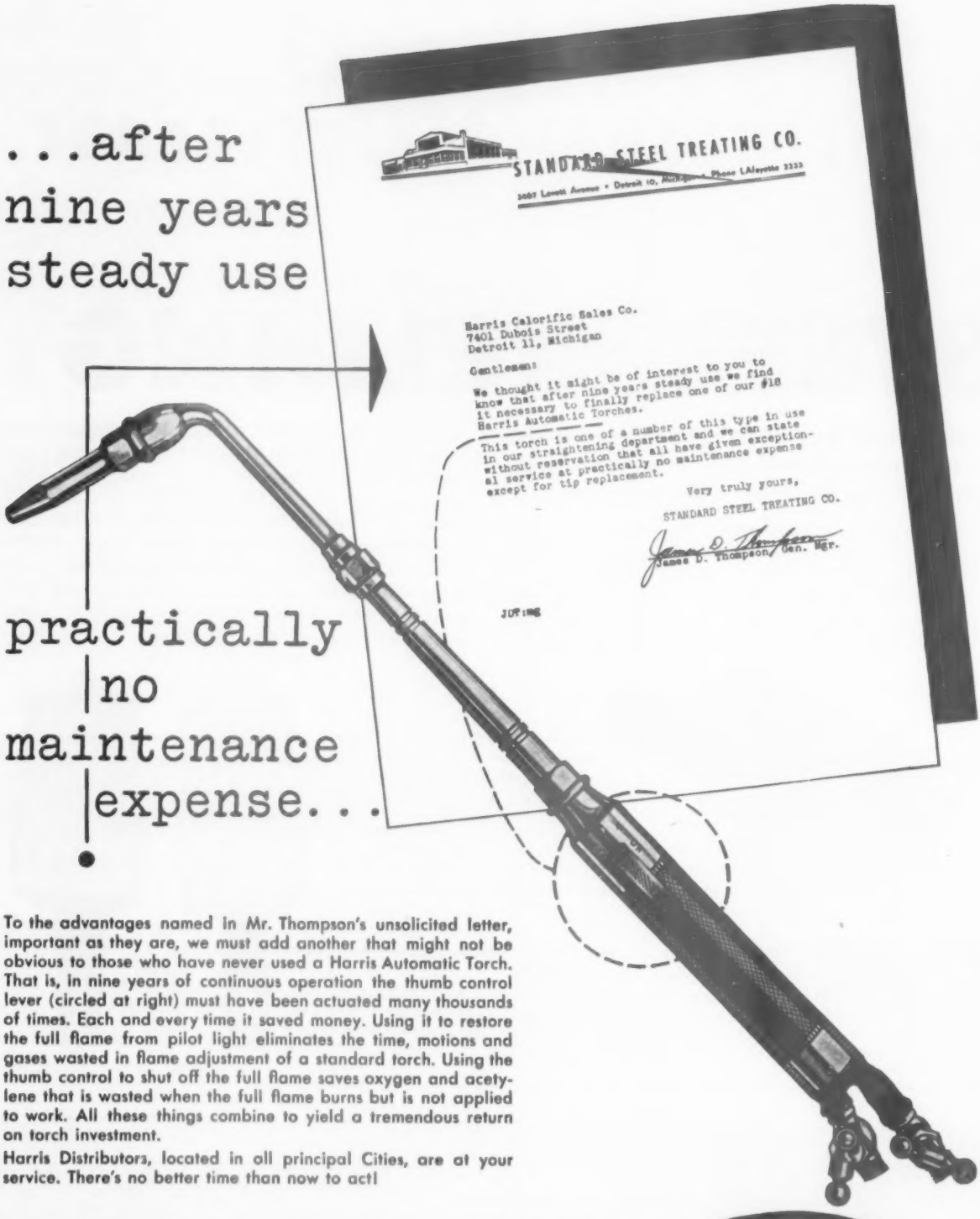
Company Name.....

Address.....

City.....State.....

...after
nine years
steady use

practically
no
maintenance
expense...


STANDARD STEEL TREATING CO.
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

THE HARRIS CALORIFIC COMPANY

Cleveland 2, Ohio

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905

a Original die after forging 3100 pieces

b same die after Rexwelding and forging 9300 pieces

CRUCIBLE REXWELD hard surfacing rods increased forging die life OVER 400%

for R. G. LeTourneau, Inc.

By Rexwelding, R. G. LeTourneau, Inc., Longview, Texas, increased the life of its production dies over 400%. The dies shown, for example, used to forge a plug adapter of SAE 1030 steel at 2350 F, had to be removed from the press after forging 3100 pieces because of excessive wear and heat checking. The same die, after worn areas were machined out and faces built up with Rexweld-A hard surfacing rod, produced 9300 pieces.

You can do the same in your shop. You'll find that Rexwelded dies have higher edge strength at elevated temperatures, and resist chipping, deformation and heat checking better. And parts can be Rexwelded over and over.

So, use Rexweld Rods on your next hard surfacing application. They are available in both bare rods and low hydrogen coated electrodes, in a wide range of grades and sizes. Call your local Crucible representative — he can provide a grade of Rexweld adapted to your specific job.

Join your Civil Defense Team NOW!

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking

REXWELD HARD SURFACING ROD

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MAX-EL • SPECIAL PURPOSE STEELS

SPEEDY is the word for SPEEDEX, the new Murex contact electrode. Iron powder in its heavy coating improves arc action and supplements the deposit from the core wire to give amazingly high deposition rates. With SPEEDEX you can increase welding output and cut deeply into time and labor costs (by far the major expense items in any welding operation).

SPEEDIER steel electrode — twice as fast as an E-6012 rod — than any conventional mild provides deposition rates up to nearly 10 lbs. an hour with a 3/16" electrode, almost 15 lbs. an hour with a 1/4" electrode. This means you can make single pass fillets at unheard of travel rates — 15 inches a minute or better.

SPEEDEX

is an operators' rod too.

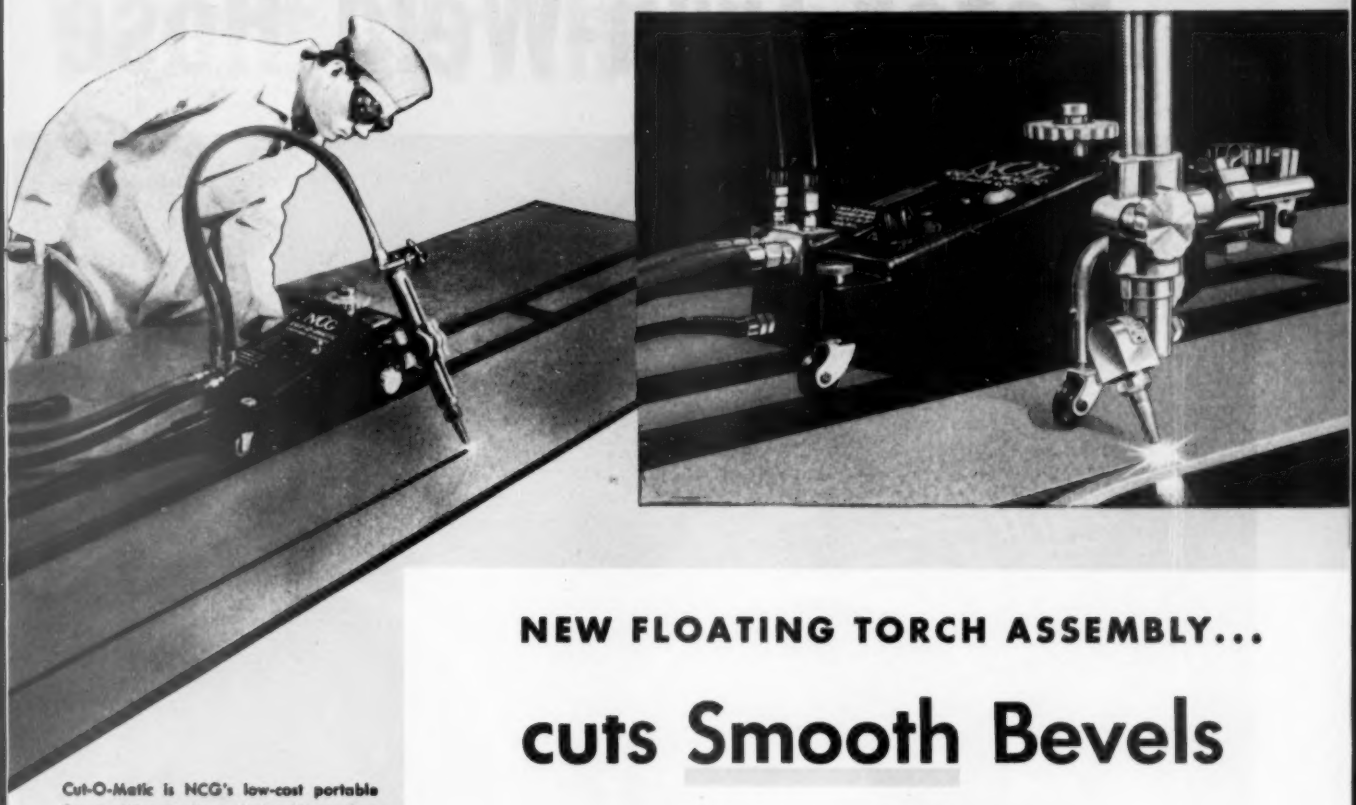
They like its smooth, easy arc action — with either the drag or the open arc technique. It gives them no trouble with sidewall wash or undercutting. Its slag is almost self-removing. The finely rippled deposit has excellent surface appearance. And, under the surface, SPEEDEX welds are strong, sound and ductile — 85,000 to 90,000 psi ultimate strength with 73,000 to 78,000 yield and 15% to 25% elongation in 2 inches.

Ask to have SPEEDEX demonstrated on your production welding.

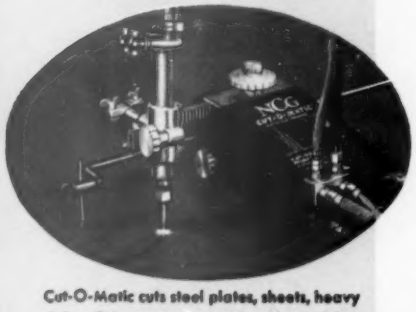
MUREX *Electrodes • Arc Welders • Accessories*

METAL & THERMIT CORPORATION 100 EAST 42nd STREET NEW YORK 17, N. Y.

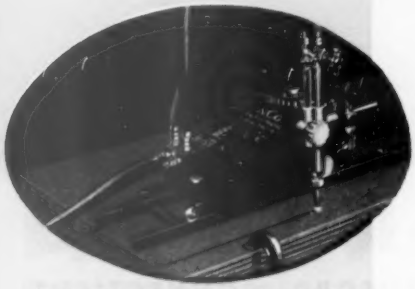
to increase Cut-O-Matic's® Versatility



Cut-O-Matic is NCG's low-cost portable flame-cutting machine. Motor driven. Runs on own tracks. Weighs only 50 lbs. Can be carried anywhere. Saves time and gas.



Cut-O-Matic cuts steel plates, sheets, heavy slabs. Cuts on square or bevel, straights, strips, circles, rings and arcs.



Stack cutting. Sheets can be clamped together, and cut all at once, giving real production and economy.

NEW FLOATING TORCH ASSEMBLY...

cuts Smooth Bevels on Wavy Plate

The usefulness and versatility of Cut-O-Matic that have placed this low-cost, portable flame-cutting machine in so many shops, are now broadened greatly with the introduction of the Floating Torch Assembly. This NCG development automatically results in smooth, accurate bevels on wavy or bulging plate surfaces. The contour wheel raises or lowers the swivel-head beveling torch to compensate for surface unevenness, holding torch tip at same angle and distance from plate.

This is only one of many superiorities that make Cut-O-Matic so profitable, productive and economical. You can have the versatile Cut-O-Matic and the Floating Torch Assembly demonstrated in your own shop without charge or obligation. Contact your nearest authorized NCG dealer or NCG district office. Or write for free catalog to address below.

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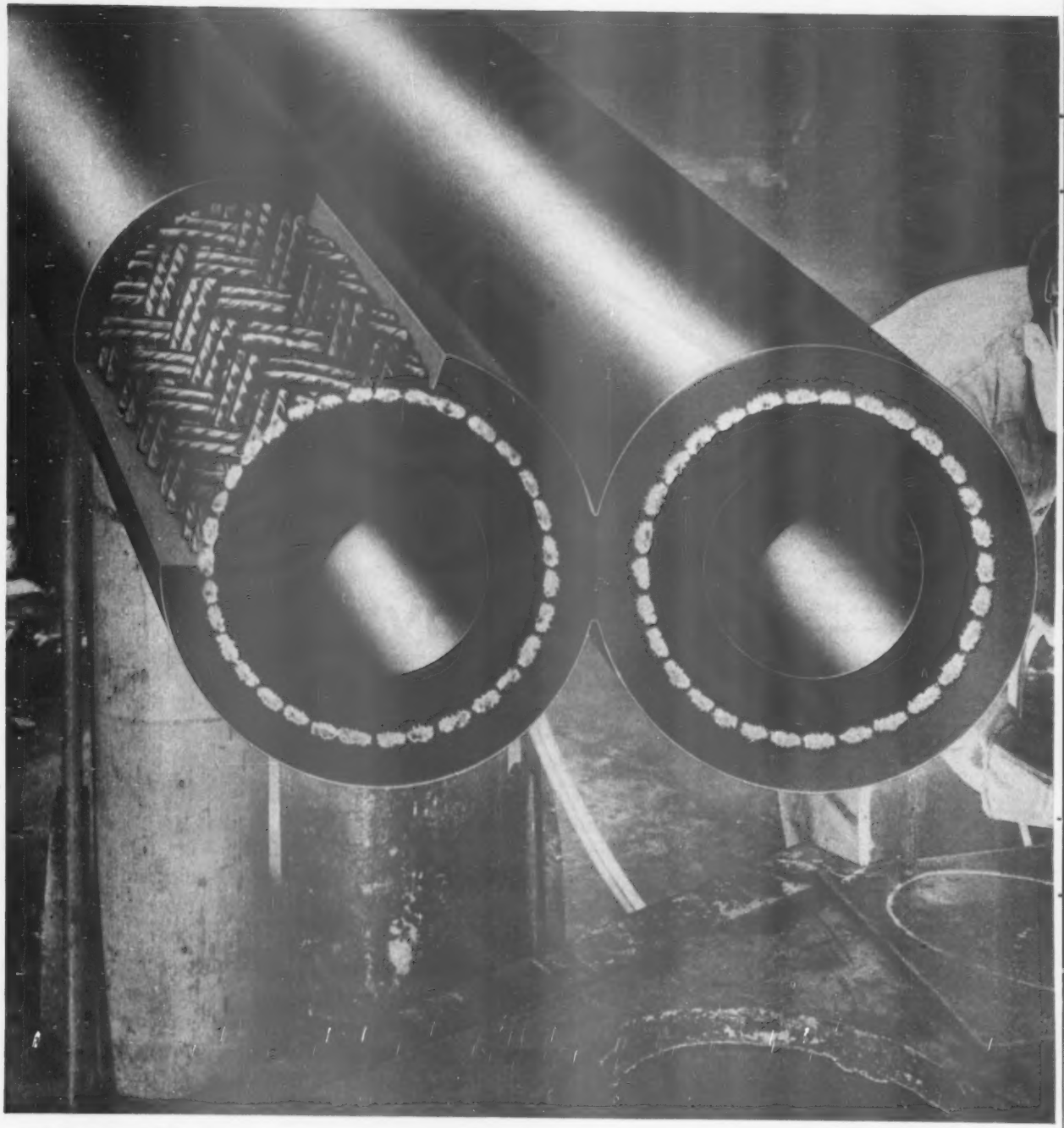

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EXECUTIVE OFFICES, STAMFORD, CONNECTICUT

Won't Writhe or Twist

Hewitt-Robins Twin-Weld—the original Twin-Line Welding Hose—Offers Values Found in No Other Hose... Single or Double Line!

Here is the safest, easiest-handling welding hose that money can buy. Twin-Weld—*the original twin-line welding hose*—won't writhe or twist on the job as other welding hoses do because it's "straight-cured". Its two lines are firmly bonded together, easily separated for making connections. Twin-Weld is non-porous . . . eliminates welding inefficiency, explosions and fires.

For greater safety and maximum flexibility . . . longer welding hose life . . . buy Hewitt-Robins Twin-Weld.

ENGINEERING DATA

TUBE: Non-porous, smooth tube for full free-flowing of gases at all times.

CARCASS: Now reinforced with a single braid of high-tensile rayon yarn, applied with special braiding equipment . . . equal in strength and fabric content to the highest quality two braid hose.

COVER: New flame-resistant, oil-resistant cover made from premium quality synthetic compound that won't become hard or brittle. Surface is smooth . . . won't crack, peel or discolor . . . resists abrasion of sharp metal, heat, grit, dirt and ozone checking. For quick, positive identification oxygen line is green—acetylene line is bright red.

SIZES: O.D.'s now conform to IAA specifications—7/16", 17/32", 19/32" . . . I.D.'s 3/16", 1/4", 5/16".

WORKING PRESSURES: Up to 200 psi.

Here is a partial list of

HEWITT-ROBINS PRODUCTS

that will help you cut handling costs and increase operating efficiency.

MACHINERY

Belt Conveyors
Belt & Bucket Elevators
Car Shakeouts
Conveyor Idlers
Dewaterizers
Mechanical Feeders
Foundry Shakeouts
Mine Conveyors
Reclaiming Systems
Screen Cloth
Stackers & Trippers
Vibrating Conveyors & Screens

INDUSTRIAL RUBBER PRODUCTS

BELTING:

Conveyor
Elevator
Transmission

HOSE:

Acid
Air & Air Drill
Barge Loading
Dust Suction
Fire
Fuel Oil & Gasoline
Gasoline Pump
Mud Pump Suction
Oil Suction & Discharge
Propane-Butane
Road Builders'
Rotary Drilling
Sand Blast
Sand Suction
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Servall®, All-Service
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Vacuum & Air Brake
Water & Water Suction
Welding, Twin-Weld®

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For information and service on industrial rubber products, contact your Hewitt-Robins Industrial Supply Distributor. Through his complete stock of Hewitt-Robins Rubber Products, and his familiarity with local field conditions, he can fill your supply needs promptly and correctly. See Classified Phone Book for the Hewitt-Robins Industrial Supply Distributor serving your area.

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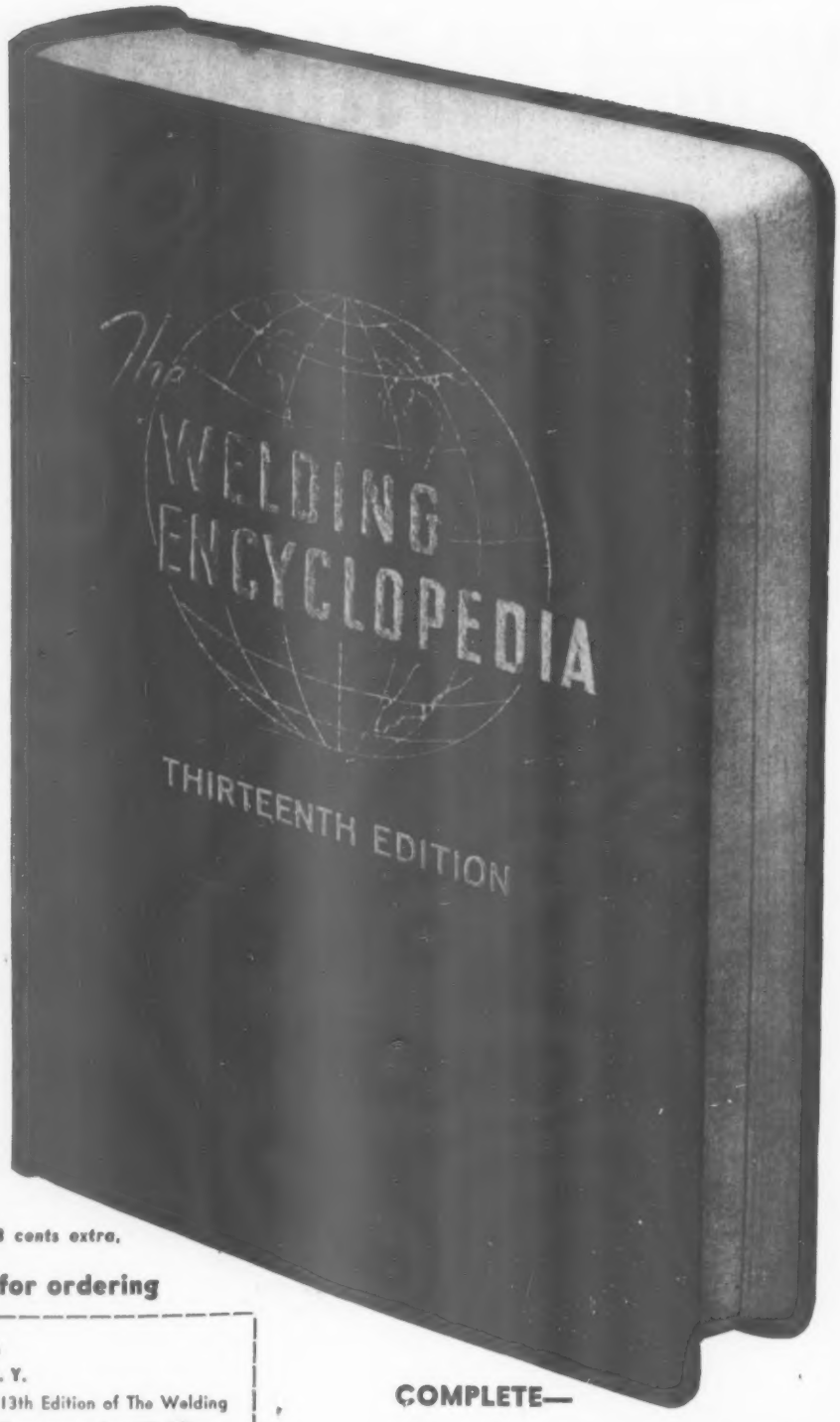

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all welding fundamentals and practices in one volume. A working guide for all welding applications in all industries. Covers all phases of welding, cutting, flame treating, etc. Applicable to problems of production, repair and maintenance.

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WITH

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LOW TEMPERATURE SILVER BRAZING ALLOY

ALLEN-BRADLEY

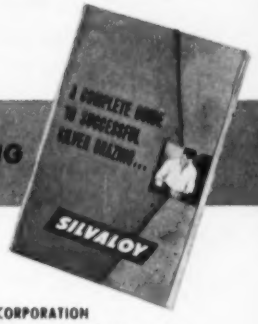
This is a new Allen-Bradley Manual Autotransformer designed to handle main line current. The photographic insert shows a disassembled view and an assembled illustration of the double contact design used in the unit.

This advanced type of manual autotransformer starter engineered with many new features by Allen-Bradley is a noteworthy addition to their line of motor controls.

The stationary and movable contacts used in this unit are Silvaloy brazed to be certain of peak electrical conductivity. Also, Silvaloy brazing may be done at a temperature low enough to protect the physical properties of the silver contacts and yet allow the Silvaloy to flow freely for positive bonding.

For dependable low temperature silver brazing alloys, call the Silvaloy distributor in your area. They will be glad to send a Silvaloy Technician to help you develop low cost, high production brazing procedures for your products. There's no cost or obligation involved, of course.

FREE! SEND FOR THIS COMPLETE GUIDE TO LOW TEMPERATURE BRAZING



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OXWELD rods, fluxes, and accessories will consistently give superior performance in any welding shop. For they are backed by LINDE's 45 years of research, development, and practical experience in oxy-acetylene welding and cutting processes. Always look for the OXWELD brand. It is your assurance of getting highest quality products.

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"Helpful Facts About OXWELD Welding Rods and Supplies"

Get your copy of this 32-page booklet from your LINDE jobber today. Or write to LINDE AIR PRODUCTS COMPANY, a Division of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. In Canada: Dominion Oxygen Company, Limited, Toronto.

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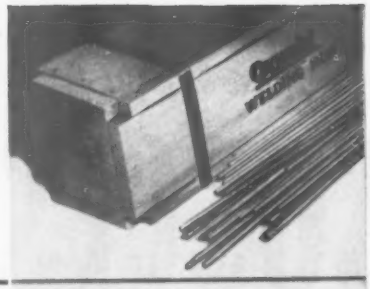
OXWELD RODS

are manufactured under rigidly controlled conditions to give top performance in any welding shop. Only five types of OXWELD rods are necessary for all average welding jobs.



OXWELD FLUXES

make it easy for you to get high quality welds every time. They provide a chemically clean surface and assure thorough fusion of rod and base metal during welding.

OXWELD GOGGLES

are built to give maximum eye protection with excellent visibility free from eyestrain and fatigue. Three shades of lens coloring are available to meet individual needs.

OXWELD GLOVES

furnish full protection for wrists and forearms as well as hands. Made of tough, flame-resistant suede leather, they are unusually soft and comfortable.

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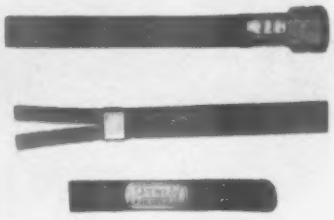
is available in single and double styles and in fitted lengths. It is light, durable, flexible, and practically immune to deterioration from sun and weather.



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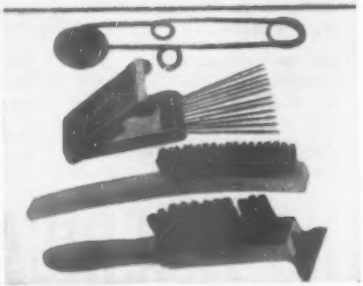
Friction Lighters
Tip Cleaners
Wire Brushes

for efficient welding and cutting operations.



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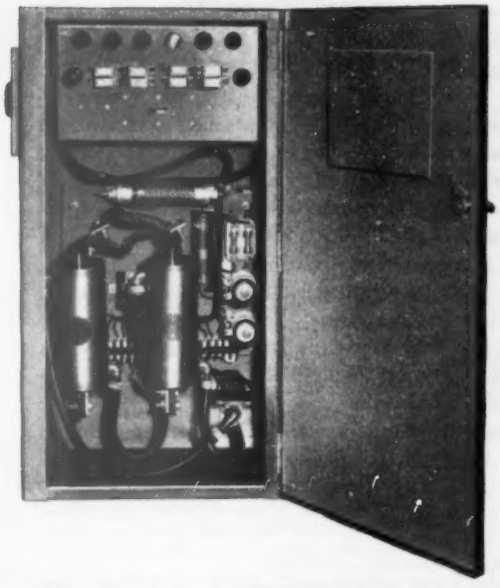
G-E Resistance Welding Controls Make Faster, More Accurate Welds



TYPICAL PANEL is neat, compact. Advanced circuit design is result of long experience in control design and manufacture. Spot-welding panel above is non-synchronous. NEMA Type N2.

The occasion probably will never arise when you'll have to weld 199 pieces of metal together, but you could—with G-E controls.

SINCE 1888, when Elihu Thomson developed the first resistance welding transformer, G-E engineers have been designing welding controls for all production requirements. Whether your operation demands speed or accuracy or both, specify G-E control. G.E.'s complete line includes synchronous-precision, nonsynchronous, three-phase, and all special-purpose accessories for all welders.

FOR MORE INFORMATION, contact your nearby G-E Apparatus Sales Office or welding machine manufacturer or his agent, or write:

Section G785-7,
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Please send the following bulletins:

☐ GEA-5816, "The Story of Resistance Welding"; theory behind the process and complete description of all G.E.'s controls.
☐ GEA-5945, "Synchronous-Precision Control."

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GENERAL ELECTRIC

IN ONE MINUTE'S TIME

AWS Class E-6012 electrode produced this fillet

THIS MUCH MORE WELD

was made in the same time in the same steel plate

Actual length of welds: E-6012 — 5-1/16", Easyarc 12 — 12". Current settings: 230 amps AC for E-6012; 275 amps AC for Easyarc 12. Both welds made in 1/4" plate with 3/16" dia. electrodes.

with the new

AIRCO®

EASYARC 12

Airco's new EASYARC 12 actually welds mild steel in about half the time it takes with conventional AWS Class E-6012 and E-6013 electrodes. EASYARC 12 has a completely new type of flux coat that contains a high proportion of powdered metal. This lets you use higher currents without breakdown of the coating, and vastly increases deposition rates, since the flux itself adds metal to the weld.

Besides being fast, EASYARC 12 is far easier to handle. Welds are made by "dragging" the electrode along the joint. Spatter is almost negligible. And EASYARC 12's slag is practically self-cleaning.

For complete information and prices — get in touch with your Airco office or dealer right now.

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Welding Info-Aids . . .

1 HARDFACING ALLOYS — American Manganese Steel Division. 48-page, two-color catalog describes complete line of hardfacing and build-up rods and electrodes. Typical applications are shown in more than 70 photographs. Technical section helps in selection of correct rod for unusual wear problems.

2 ELECTRODES—A. O. Smith Corp. 36-page illustrated catalog (Bulletin No. WE-165) describes and lists specifications of company's mild-steel, cast-iron, high tensile-low alloy and low-hydrogen electrodes. Pages 4 and 5 are electrode-selector charts.

3 FLAME-CUTTER — Victor Equipment Co. 4-page illustrated brochure describes "Flame-O-Graph," new precision flame-cutting tool. Said to be highly versatile, the portable apparatus is capable of cutting a wide range of shapes and sizes because templates are easily and quickly changed. A tracing attachment is available at extra cost. Brochure includes a schematic diagram.

4 FLUX MILL—Atlas Welding & Mfg. Co. 4-page pamphlet pictures and gives specifications of mill for reprocessing flux used in automatic welding. Savings up to 70% are said to be achieved by using reprocessed flux.

5 FLEXIBLE GRINDER—Merit Products, Inc. 2-page leaflet illustrates and describes "Grind-O-Flex," a flexible grinding wheel comprising hundreds of individual abrasive cloth leaves sealed to a hard core. Blending weld spots and removing rust and scale are typical applications.

6 WELDORS' SCHOOL—The Hobart Trade School. 24-page booklet describes curriculum and organization of this school. Courses offered include arc welding, carbon-arc welding, alloy steel and cast iron, hardfacing, tool welding, stud welding, submerged-arc welding, inert-gas-shielded-arc welding, pipe welding and oxyacetylene welding and cutting.

7 WELDING CHEST—KSM Products, Inc. Specification sheet gives detailed description of new portable steel chest designed to hold complete set of firm's stud-welding equipment. The illustration depicts packing arrangement.

8 CUTTING GAS—Acetogen Gas Co. 4-page illustrated brochure lists applications and advantages of "Acetogen" cutting gas, which is said to solve flame-cutting problems. Insert page has diagrams showing its application in armor beveling.

9 WELDING WIRE—Weldwire Co., Inc. 6-page booklet WW/8/1/53 lists prices of chemically cleaned straight bare wire and precision-coiled automatic welding wire. They are stainless steels, bronzes, nickel alloys and alloy steels.

10 A-C SHOP WELDER—National Cylinder Gas Co. Bulletin NH-101 describes the new "Sureweld" shop welder for general utility welding. Heart of the welder is an exclusive four-coil transformer that provides "long" inductive coupling, high inherent reactance and uniform welding performance.

11 LIGHTWEIGHT TORCHES — Air Reduction Sales Co. Form ADC 721 describes in detail two new lightweight torches. The "Airco 400" weighs 6 oz and is designed for light welding and brazing operations. "Airco 300" weighs 5 oz, is designed for oxyacetylene burning or welding of lead products.

TO OBTAIN: manufacturer's catalog or bulletin described on this page, use the card sections printed below. Insert number of the item or items that interest you. THE WELDING ENGINEER will ask manufacturers to send the information requested.

Each card section must be completely filled out. Do not use ditto marks. These cards are not good after July 1, 1954.

How to obtain manufacturers' literature:

Fill out card section and write in number of item as shown at right:

Number → 23
Name John Smith
Company Rex Mfg. Co.
Address 3217 Lewis Ave.,
Chicago 16, Ill. Title Engineer
THE WELDING ENGINEER

Name.....
Company.....
Address.....
Title.....
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520 NORTH MICHIGAN AVE.

CHICAGO 11, ILL.

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12 MELTING FURNACES — Lindberg Engineering Co. 4-page Bulletin No. 29 contains photographs, specifications, diagrams, performance data and other technical information on firm's line of "Simplex" melting furnaces.

13 HIGH-VOLTAGE CONTROL—General Electric Co. 16-page booklet (GEA-5409) describes "Limitamp" high-voltage motor control, its operations and its applications. Two-color publication uses photographs, charts and diagrams to explain this coordinated control system.

14 BRONZES—The International Nickel Co. Entitled "Ni-Vee Bronzes," Bulletin A 107-8 (Parts 1 and 2) is a 12-page brochure presenting a family of low-shrinkage, heat-treatable bronzes for machine component pressure and bearing castings. These bronzes are said to develop excellent mechanical properties in the "as-cast" condition. Includes 35 tables, charts and illustrations. Reprinted from *Foundry*.

15 BRONZE ELECTRODES — Ampco Metal, Inc. 4-page Bulletin W-25 describes various characteristics and properties of "Ampco-Trode" line of bronze electrodes. Illustrations in the two-color brochure show typical applications and product examples.

16 CHAIN HOISTS — Harnischfeger Corp. 6-page Bulletin H-32 covers full line of "P&H" chain hoists with capacities from ¼ ton to 25 tons. Two-color illustrated bulletin includes descriptions as well as condensed specifications.

17 SAFETY CLOTHING—Safety Clothing & Equipment Co. catalog shows complete line of "Gardwell" protective clothing and equipment for the industrial worker. Included are aprons, sleeves, gloves, mittens and other types of leather and fireproofed garments.

18 HOSE CLAMPS — Punch-Lok Co. "Clampways Ideas" is the title of a 24-page booklet based on results of a contest directed to this firm's jobbers for the purpose of gathering interesting case histories of unusual uses for its hose clamps. One application is in welding coupling units or fittings to ends of welding cables.

19 VOLT-AMMETERS — Pyramid Instrument Co. Catalog No. 134 lists complete line of snap-around volt-ammeters. Includes three new high-voltage "Amprobe Junior" models for industrial plant use. Detailed specifications and features of these and other models are shown. The "Amprobe" measures current and voltage instantly without shutting down equipment.

20 WELDED PIPE TEES—Taylor Forge & Pipe Works. Bulletin 533 is 52-page reprint of ASME paper, "Design of Hot Tap Tee Connections in High Pressure Pipelines." Welding procedures are described and pictured. Bulletin also includes various charts and graphs.

21 GLOVES—Racine Glove Co. Booklet describes leather gloves and other "Gardsmen" protective equipment. Gloves have one-piece back, one-piece palm, and palm side is protected by extra leather overlay.

22 SAWS—Grob Bros. 16-page Catalog No. 11 includes pictures, descriptions and schematic diagrams of sawing, filing and lapping machines. Included is an electric butt welder for welding saw blades 1/16 to ½ in. wide. It is also furnished in ¾-in. capacity.

23 HEAT-TREAT FURNACES — Holcroft and Co. Three-color bulletin covers electric heat-treat furnaces and describes four types of electric heating elements and their methods of mounting.

24 WELDING EQUIPMENT — Hirst Electronic Development, Ltd. New catalog lists welding equipment used primarily in the valve-welding and light-instrument fields. Includes diagrams and illustrations of assembly welding benches with spot-welding heads.

25 STAINLESS STEEL — Armco Steel Corp. 4-page folder describes firm's "library" on stainless steel. Among the literature available is a booklet on welding stainless as well as a 44-page general catalog.

26 TEST INSTRUMENTS—Multi-Amp Corp. 4-page Catalog MA-154 describes line of portable high-current test instruments. Illustrations, dimensions and a general description of these calibrating and testing instruments are included with a listing of indicated uses and industrial applications.

27 NICKEL ALLOYS — Alloy Metal Wire Co. Illustrated 38-page handbook gives characteristics and specifications of wire, rod and strip nickel alloys that are said to resist heat, corrosion and destructive service conditions.

28 ROTATING VISE—The Columbian Vise & Mfg. Co. New catalog insert page illustrates and gives price data, specifications and applications of "Gyro-Vise No. 72½." The vise operates from, and rotates around, a standard base that can be mounted in any location.

29 GRINDING MAGNESIUM—Norton Co. Technical Bulletin 532 discusses grinding and polishing of magnesium and its alloys.

30 FIRE PUMPS—Worthington Corp. Bulletin No. W-450-B42 describes and gives specifications for vertical turbine fire pumps designed to provide constant protection against fire in industrial installations.

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NO JOB TOO HOT ...OR TOO TOUGH *for THESE cutting torches!* *

* VICTOR'S NEW
Series 1000
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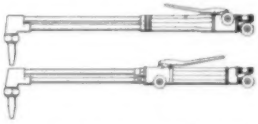
CUTTING TORCHES



CHOICE OF LEVER POSITION . . . cutting oxygen lever pivots from top rear of handle on Series 1000; from top front on Series 1100. Both Underwriters' approved. Available with 45°, 75°, 90° or 180° heads, to take all VICTOR standard-type tips.

LICK YOUR HOTTEST JOBS
without a flashback . . . solid stainless steel mixing tube absorbs heat slowly, keeps gases below flashpoint.

LAST LONGER UNDER ROUGH, TOUGH USE
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EASIER TO HANDLE, EASIER TO MAINTAIN
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Heavy Duty
WELDERS' GLOVES

T X 100

Gunn cut one-piece back. Double thickness of chrome tanned horse split leather on first finger and thumb. Lined on back of hand from wrist to finger tips. Full gauntlet. 14" long.

5 X 163

Montpelier pattern. Gives protection on gas welding and heaviest amperage electric welding. No excess bulk. One-piece back and palm of chrome tanned horse split leather welted at all vulnerable seams for extra protection.

AO WELDERS' GLOVES ARE ENGINEERED FOR THE JOB

— Just Like AO Welders' Goggles

Ask to see these highly serviceable gloves and also models TX200, 3013 and 3014 heavy duty welders' gloves; 3003 and 6X142 (one-finger mittens); and 3004 and 6X141 (full mittens).

As specialists in safety equipment, with a brand name that has symbolized quality for many years, we put the same type of engineering, research and production behind our gloves as behind the other products we make.

Examine these heavy duty gloves and you'll see that (1) they're cut generously for freedom and comfort (2) the specially chrome tanned, heat resistant leather is tough enough to take the toughest service — yet soft and flexible for comfort. Yes, there's no skimping . . . gauntlets are big enough to take tucked in sleeves neatly. Add a lining that helps prevent chafing, absorbs perspiration and gives added insulation and you've got REAL PROTECTION AND VALUE. Your nearest AO Safety Products Representative can supply you.

American Optical
SAFETY PRODUCTS DIVISION

AO SAFETY ZONE

Keep your workers in the Safety Zone with American Optical Safety Equipment

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

Saved at a cost of only 22^{50} ...and back on duty at 1650°F

This Inconel® radiant tube had served 15,000 hours in a pit type gas-fired furnace at temperatures as high as 1650° F.

Then, finally after four years of rugged duty, a break occurred where the tube joined the burner. The rest of the tube was in good shape, so Electric Auto-Lite engineers decided to salvage it rather than purchase a new one.

This was possible because deposits of Inconel welding wire have the same resistance to oxidizing and reducing atmospheres as the parent metal and good strength at high temperatures.

They called on The Industrial Fabricating Co. of Toledo, Ohio to do the job.

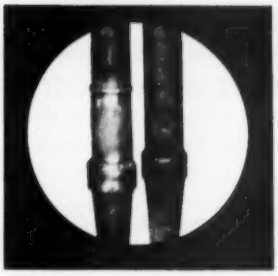
Here's how Industrial proceeded...

First, they rebored the old burner casting and inserted a new 8-inch long segment of 3½" O.D. tubing with a wall thickness of .109". Then they joined the new tube segment to the old burner casting with "62" Inconel filler wire. An inert gas shielded process was used to eliminate any possibility of slag entrapment which would weaken the weld.

Finally, they butt welded the new tube section to the other end of the old radiant tube. Now the tube is back in service ready for more long hours of high-temperature duty and the total cost of the salvage job was only $22.50 compared to the substantially higher cost and time required for a new replacement.

This is another case of how an Inco Nickel Alloy welding wire saved an expensive part and helped return it to useful service. It's always good to remember that regardless of the welding method preferred, there is a suitable Inco welding wire or electrode for welding Inco Nickel Alloys. Another thing, too, if you're up against a tough welding problem, Inco's Technical Service is always ready to help you find a solution.

Discuss your welding problems with Inco's welding engineers at the Second National Welding Show,



The Industrial Fabricating Co., of Toledo, was able to save this Inconel radiant tube for Electric Auto-Lite Co., of Cleveland, for only $22.50. The tube was fabricated construction which made the repair feasible. Welder is using a tungsten arc welding torch and "62" Inconel filler wire. Inco's "60's" series of welding wires are especially made for inert gas shielded metal arc welding processes.

May 5-7 (booths 158-161, Memorial Auditorium, Buffalo, New York).

Write today for your free copy of "Inco Welding Materials." It outlines recommended materials for similar and dissimilar joints involving Inco Nickel Alloys.

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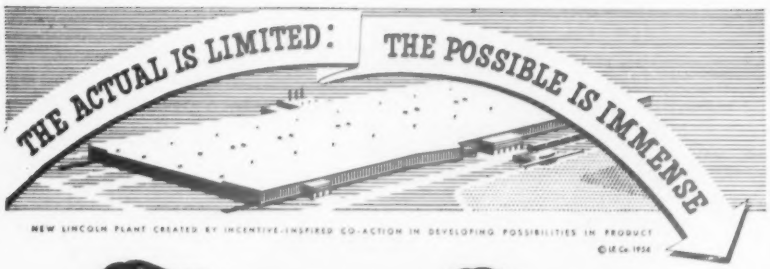
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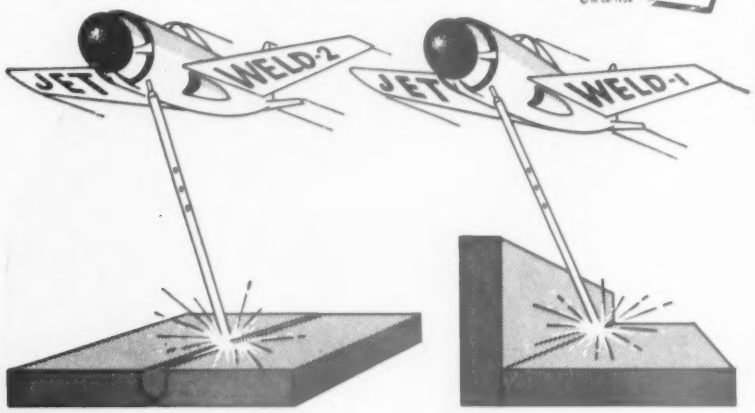
THE POSSIBLE IS IMMENSE
NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT



JETWELDS COST-CUTTING TEAM SPEEDS WELDING 35% AND MORE

FOR THE FIRST TIME, Lincoln Jetweld joins powdered metal with the electrode to achieve fastest hand welding speeds ever accomplished. Jetweld's phenomenal speed lies in utilizing the maximum heat of the arc for melting the parent metal, core wire and coating.

GET JETWELD'S COST-CUTTING FACTS TODAY... Have your Lincoln welding engineer demonstrate Jetweld's many cost saving features. Or write for free Bulletin 481.

JETWELD-2 (E-6020)

Extra fast electrode for flat, deep grooves and flat and horizontal fillets.

Tensile strength (As welded) 62,000 psi minimum

Yield strength (As welded) 52,000 psi minimum

Elongation in 2" (As welded) 25% minimum

JETWELD-1 (E-7020)

Extra fast electrode for flat and horizontal fillets.

Tensile strength (Stress relieved) 80,000—90,000 psi

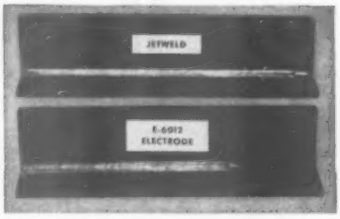
Yield strength (Stress relieved) 65,000—75,000 psi

Elongation in 2" (Stress relieved) 25%—30%

Jetweld electrodes have been tested and approved by the American Bureau of Shipping and are certified to conform to AWS classes E-7020 (Jetweld 1) and E-6020 (Jetweld 2).

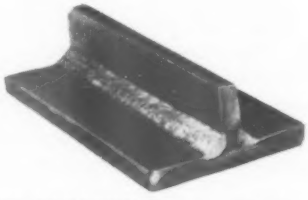
This certification authorizes the use of these two electrodes in shipbuilding supervised by the American Bureau of Shipping and the U. S. Coast Guard.

BENEFIT THREE WAYS WITH LINCOLN JETWELD



35% AND FASTER welding speeds are possible with the new Lincoln Jetweld electrodes. That's because powdered metal coatings utilize the heat of the arc more efficiently to increase welding speeds. Iron powder, melted by excess heat available in the arc, becomes an additional source of metal for the weld.

HIGHER QUALITY Weld metal is uniform, of X-ray quality, free of undercut with improved impact values at low temperatures. There is no coating breakdown . . . stub losses are less. Bead appearance is smooth . . . looks like an automatic weld.



LESS CLEANING is required with Jetweld. Heavy coating and short arc prevent spatter. Slag is self-cleaning. Excellent "wash-up" eliminates undercutting and entrapped slag.

THE LINCOLN ELECTRIC COMPANY

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CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

ESTABLISHED 1916

THE WELDING ENGINEER

APRIL, 1954

Anyone can give things away

OUR EDITORIAL in the February issue suggested that there isn't anything wrong with business at present that good selling will not correct. It was gratifying to see that many of our readers expressed agreement. Unfortunately, from reports I get, a few welding distributors and welding shop owners seem to be so anxious to make a sale that they are attempting to give their goods and services away.

There are two schools of thought about price cutting in the welding business. One school holds that the reason the margin of profits on welding equipment and electrodes is so low is that the distributor would merely cut prices if he had a larger margin. So why give it to him? I think this argument is founded on a rather weak factual base. Comparatively few distributors are price cutters.

The other school advocates that welding equipment and supplies be "fair traded." This means, simply, that a strong hand should crack down in punishment of any distributor who dares to undersell his competitors. Examples of "fair trade" are to be found in many fields.

To me, fair trade practices seem to contradict the Sherman Anti-Trust Act, which prohibits price fixing. Even if they are legal, however, I find them objectionable for another reason: such set-ups tend to reward the inefficient. For this reason, I do not believe manufacturers should be allowed to fix prices, though they certainly do have the right to suggest what selling prices should be established.

IF A FELLOW running a welding supply business does not have brains enough to make a fair profit, that's his misfortune. I don't think that everybody should be regulated merely to protect the dopes. Look at poor old England, loaded down with regulations like the chains of Marley's ghost, and then tell me if you think that sort of thing is desirable to introduce into a free industry.

The cost of selling any article, whether it is a hardfaced plowshare or the hardfacing alloy that goes on a plowshare, should be determined by the cost of the material, labor, overhead and a fair profit. The distributor or welding shop owner who can add up these four items and then sell for less than his competitor is to be congratulated. It means that he is running an efficient business. But the distributor whose lower price is at the sacrifice of a fair profit is on the road to going out of business.

ONE DISTRIBUTOR who talked to me was quite worried because he couldn't meet a competitor's price on oxygen to large accounts. The competitor was delivering oxygen miles away from his home plant and yet was underselling. It looked to me as though the competitor was the one who should be worried. Regardless of the volume you may be doing, you can't continue in business unless you are making a profit. In this case, the profit simply wasn't there at the price quoted.

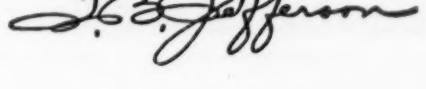
It is true that price-cutting tactics are sometimes used as a lure to snatch a big account away from the fellow who has been serving it. After the big fish has been well hooked, the price goes back up. This, of course, is an excellent way to win no friends and influence customers—against you. Nevertheless, they keep on doing it.

It has been pretty well established in our industry that a 25% margin of profit is necessary for a distributor. Let's see what happens to a distributor who falls for the "big volume" fallacy.

If he cuts his 25% margin of profit to 20%, he must do 18 2/3% more volume to stay at the same level of dollar profits. That's only a 5% cut. An 8% cut requires 35⅛% more volume, a 10% cut 50% more volume, a 12½% cut 75% more volume. If 15% is hacked from the 25% margin, leaving a net profit margin of 10%, that distributor will have to do 112½% more volume to get the same dollar profits he was getting with his 25% margin. This means that if he cuts his price 15% on a $100 piece of equipment, he will have to sell $112.50 of additional welding equipment to make up the $15 he gave away.

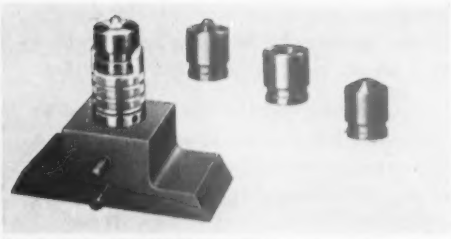
Price cutting begins to look silly, doesn't it? And it will make him feel silly, too, when the sheriff moves in to take over.

It takes brains and hard work to sell. Anyone can give things away.

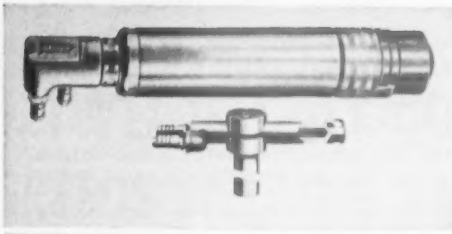


For All Your Resistance Welding Needs ...CALL MALLORY!

Mallory resistance welding supplies and services can meet all your requirements — whether for simple electrodes, or complicated, custom-built dies.

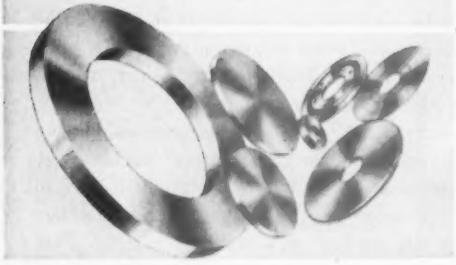


MALLORY "NU-TWIST*" DIE ADAPTORS. Now, you can change resistance welding die set-ups in a matter of seconds. By using different electrodes in the "Nu-Twist" die adaptor you can handle several resistance welding jobs with only one die set-up. A variety of electrode insert blanks is available from stock. Special shapes can be custom made.



MALLORY HOLDERS. Standard holders, available from stock, can be combined to handle practically any resistance welding job requiring extremely light pressures to over 6000 pounds. Mallory "Nu-Twist" and "Premium" holders will perform in the high pressure ranges needed for welds to meet all military specifications.

MALLORY FLUTED ELECTRODES*. Available in standard, straight, single and double bend off-set shapes, Fluted Electrodes—a Mallory exclusive—offer a 70% increase in cooling area . . . faster heat dissipation . . . positive tube centering . . . all at no extra cost. You get longer life, more uniform welds, less down time, more welds per dollar.



MALLORY SEAM WELDING WHEELS. Forged from Mallory developed alloys, these seam welding wheels are available in sizes to meet all machine requirements. They are machined to exacting tolerances . . . cast and forged under rigid controls. You get stronger, more consistent welds . . . fewer interruptions for dressing.

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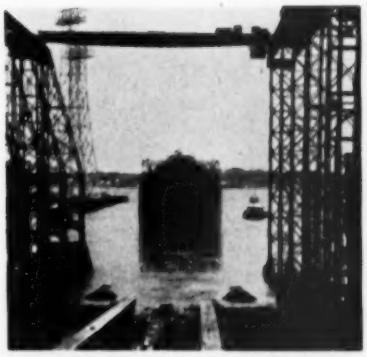
For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

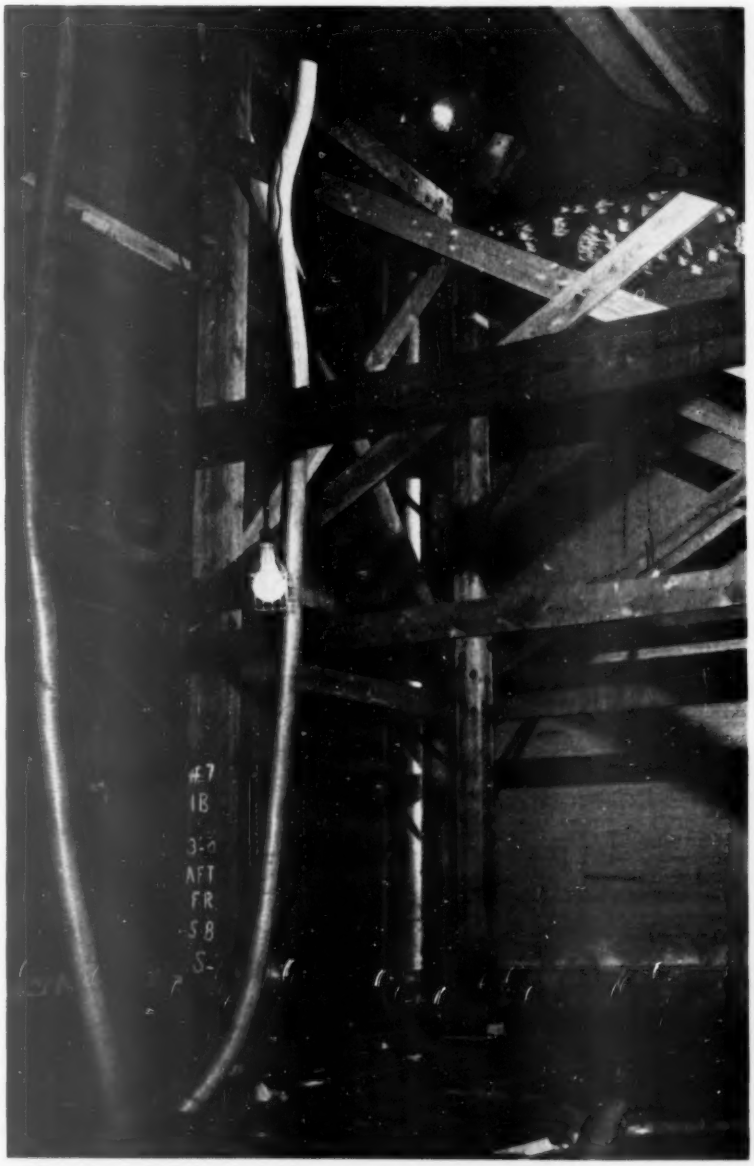
Nickel-lined ship for liquid chemicals

Hot caustic soda isn't exactly our idea of a cocktail, but the SS *Marine Dow-Chem* can swallow hundreds of gallons of it without blinking. Every modern process was used to weld her nickel-lined stomachs and nickel plumbing.

BY HERMAN C. PHELPS



WHEN hull hit the water, ship was less than one-quarter completed



ONE of the giant nickel-lined tanks for hot caustic soda. The welding arc shown at the top of this photo is a long way up from the bottom of the tank

FIRST all-chemical-carrying ship ever to slide down the ways is being outfitted as these words are written at the Quincy, Mass., shipyard of the Bethlehem Steel Co. This vessel is named the SS *Marine Dow-Chem*. She will make her maiden voyage sometime soon, flying the flag of the Marine Transport Lines but under charter to Dow Chemical Corp. She will sail between that company's Freeport, Texas, division and ports on the Gulf and East Coast.

Equivalent in size to an 18,000-ton petroleum carrier, the *Dow-Chem* is the first ship especially built to carry liquid chemicals. Her 24 center tanks are expected to carry eleven different chemicals, which may be under pressure or at a temperature of up to 230 F. Including wing tanks, her total capacity is over 5,000,000 gallons. She is 551 ft long, 68 ft of beam and can travel at a speed of 15 knots.

Four big tanks located aft near the stern of the ship have been expressly designed to carry 73% caustic soda. Because of the high corrosion and embrittlement factors present in handling, transporting and storing of this material, design engineers specified either pure nickel or nickel-clad steel for every piece of equipment coming into contact with it.

Nickel the Answer

Tests in both plant and laboratory, plus operating experience over a long period, have demonstrated that pure nickel is a highly satisfactory material for handling caustic solutions. Nickel also confers on its alloys a high degree of resistance to corrosion by such solutions. For example, Monel, containing approxi-

MAN'S hand gives scale—note the thickness of nickel-clad plate

BLOWERS were provided to draw nickel fumes away from the weldor

mately two-thirds nickel, has resistance to corrosion by caustic equivalent to that of nickel. Similarly, moderate additions of nickel to cast iron or steel greatly improve their resistance to corrosion by caustic alkalies.

Iron and steel, though widely used in the processing of caustic soda, are in some instances lacking in two important respects. In the first place, iron and steel will rust if the exposure to caustic is interrupted by periods of exposure to air, water or neutral solutions. Secondly, when iron is corroded by hot concentrated solutions, the caustic is also seriously corroded by the iron.

After extreme care has been taken to assure high purity in the production of caustic, it is important to preserve it in that condition during transport to the user. High-purity caustic is needed in large quantities by manufacturers of rayon, soap and photographic film. Even very slight quantities of iron and copper are distinctly undesirable. Nickel has proved to be the answer. As long ago as 1930, tank cars of nickel-clad steel were built for transporting iron-free caustic, and barrels of nickel-clad steel have long been used for carrying smaller quantities. Considerably less expensive than pure nickel of the same thickness, the clad steel does the same job of preserving product purity.

The four caustic soda tanks on the SS *Marine Dow-Chem* are approximately 39 ft by 22 ft by 28 ft and are constructed of ½-in.-thick nickel-clad steel plate. The nickel layer represents from 10 to 12% of the total plate thickness. The tanks are fabricated by several different welding processes, using pure-nickel filler wire. Altogether over 685,000 lb of nickel-clad plate and 47,000 lb of pure-nickel pipe, valves and fittings were consumed in building these tanks. Some of the pipe is 10 in. in diameter and has a wall thickness of ⅜ in. It was formed from flat plate and submerged-arc welded. The fittings were then tungsten-inert gas welded in place. The pure-nickel pipe is needed for transferring the cargo and also for steam coils.

To avoid solidification during shipment, caustic of the required strength is loaded hot and kept hot. You can imagine what such a brew would do to plain steel. The excellent corrosion resistance of nickel assures long life to the tanks and the arrival of the cargo in an uncontaminated condition.

Welding on Tanks

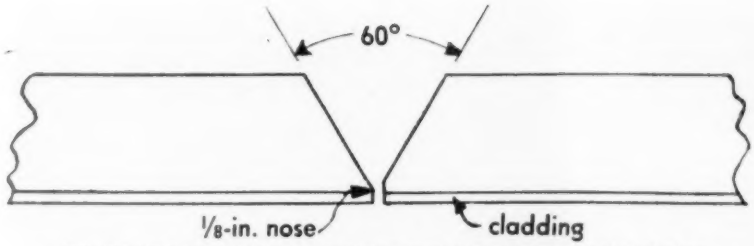
Each weldor doing ni-welding was instructed in the use of nickel electrodes and was taught the Mig and Tig welding processes. Rigid welding tests were made to determine operator ability. Most weldors passed these tests and were certified after only four hours of the special instruction.

A standard joint design for welding nickel-clad steel was used throughout the tanks. As shown by the sketch, it is a double vee with a 60-deg included angle on the steel side and a ⅛-in. nose on the nickel side. The edges were machine planed in order to insure perfect fit-up.

All nickel-clad grooves and surfaces had to be free of dirt, oil, rust

WELDS near a tank corner. The rounded contour aids drainage of liquid cargo and facilitates tank cleaning

FOUR-corner joint of vertical plate shows depth of chipped vee and number of metal-arc passes required



STANDARD joint design for welding steel side of the nickel-clad plate

or any other foreign matter. The welding areas were cleaned by carbon tetrachloride or other suitable solvents.

Procedure Followed

The welding procedure was as follows:

First, the steel side of the clad plate was welded. The electrode burnoff in the initial pass had to be carefully controlled to avoid burning into the nickel cladding. After the steel had been welded, the nickel side was then chipped or coped to sound metal. The normal coped area was approximately ¼ in. deep with a 5/16-in. throat. Bethlehem engineers discovered that nickel in its wrought state is not difficult to chip. Carbide precipitation, however, will cause the nickel to become very hard, and it is then difficult to chip without tearing of the cladding.

It was most important, of course, to avoid any dilution of the nickel from the steel side. The iron contamination of the nickel was limited to 5%. Many felt that this would be too difficult to obtain, so the welding department of Bethlehem Steel embarked on a research program to determine just what could be accomplished. A series of experimental tests showed that under reasonable production methods the nickel-clad weld metal deposit could be maintained *below* 5% of iron contamination without difficulty.

Metal-arc welding was done by rectifier-type welders that were located on platforms on the main deck. For vertical and overhead welds ⅛-in. nickel electrodes were used with reverse polarity, while 5/32-in. electrodes were used on the flat grooves in the tank bottoms.

First Pass Chipped Out

The first pass was deposited in the coped groove. Then—and here is the secret— *half of the first pass was chipped out!* Additional passes were then deposited to fill and dress the groove. A normal groove took three passes, and extra passes were deposited as required for "abnormal" grooves. Any tears in the nickel cladding due to chipping were repaired before the final pass was deposited.

Nickel weld metal does not spread like the pool in steel-electrode welding. This means that electrode metal must be placed where it is required, which is done by weaving the electrode slightly. The best position for downhand welding is to hold the electrode at an incline of less than 20 deg from the vertical, ahead of the puddle. This position is best suited for control of the molten flux and elimination of slag entrapment. It is also essential to maintain a short arc.

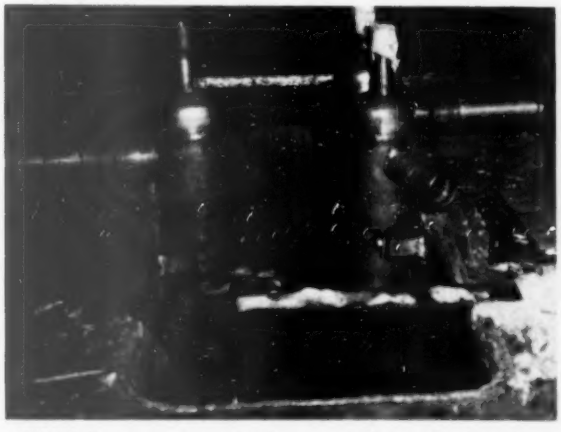
Overhead Welding

For overhead welding, the only change necessary is to shorten the arc slightly and lower the current by 5 to 15 amp. For vertical welding, the amperage must be lowered 10 to 20% from the normal flat welding heat. On metal ⅛-in. thick, vertical welding can be done from the bottom upward or from the top downward. The electrode can also be held approximately at right angles to the plate being welded.

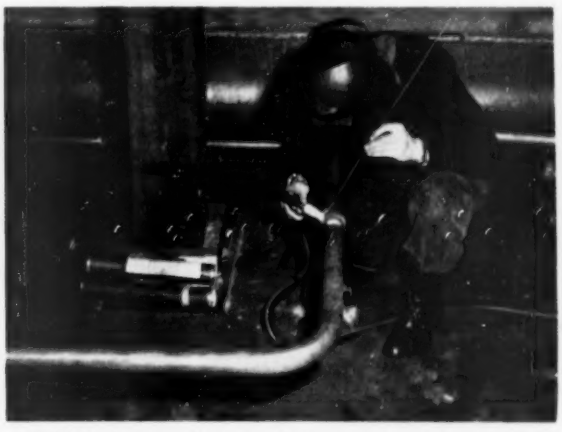
On the third and final pass on the clad metal, the rate of rod deposition for vertical welding was very slow. With ⅛-in. rod, only about 2 to 2½ in. of weld bead could be deposited with a single electrode. Yet all welding was above par.

When the arc is broken for any purpose, it must first be shortened slightly. The rate of travel is then increased to reduce the puddle size. This reduces the possibility of crater oxidation, eliminates the rolled leading edge of the crater and provides an excellent condition for the restrike.

Pronounced spatter during metal arc-welding was found to indicate that: (1) the arc was too long; (2) excessive amperage was being used or (3) the polarity was incorrect. Arc blow is encountered only under unusual conditions when welding



EVEN the steam traps in the sump (for gathering condensation of foreign matter) were made of pure nickel



HEAVY pipe couplings on the steam coils (also of pure nickel) are being welded by tungsten inert-gas process

CHIPPER removes 2-in. sample, which will be sent to chemical laboratory to get a spectrographic analysis

GAMMA rays (note suspended pellet) probed welds of subassemblies and ship installations for hidden flaws

nickel. Undercut welds were not permissible.

Ventilation a Must

One problem aboard the hull that was not present in the shop and dock welding was ventilation. Nickel welding fumes are dangerous, and proper precautions had to be taken to remove them. Suction blowers were held close to the arc to pick up smoke and fumes. This avoided the sort of thing that Old Kettlehead's boys got into last month ("Ket in a Tight Spot," The Welding Engineer, March, 1954).

Some magnetic disturbances were noticed at first on the initial welds aboard the hull. Another unusual problem for shipboard weldors was the rigid rule against the welding of scaffolding to the clad plate. A welded ladder of pure nickel was a permanent installation to protect the nickel surfaces. The bottoms of the tanks were kept covered by plywood.

Before the tanks were installed aboard ship, sections were welded together by metal inert-gas process, using a 0.045-inch spooled nickel wire. A total of sixteen subassembly units comprising the bottom, two sides and tops of each tank were welded by this method in the shop. The sump tanks were also shop jobs.

Mig welding proved to be the fastest method of fabrication. However, it could not be used aboard ship because pressure on the water used for coolant varied too much when the gun was being held at different elevations in the tanks.

Tungsten inert-gas (Tig) welding with helium was used on the pure-nickel piping. The welder was a d-c rectifier type, and the electrode 3/32-in., 2% thoriated tungsten. The inert gas eliminated the need for backing rings.

Welding Nickel Piping

All pipe joints had to be prepared according to specifications and also had to be free of oil, grease, paint and foreign matter. Before any welding was done, each joint was wire brushed with a power-driven rotary brush having stainless-steel wires. The joint areas were then washed with carbon-tetrachloride or suitable solution. The filler wire was carefully wiped just before it was used.

Weld layers could not exceed the diameter of the tungsten electrode nor a width of 3/16 in. Each start and stop area, on every bead and on each layer of weld metal, was chipped. Groove welds were built up to approximately 1/32 in. under flush before the dress pass was deposited.

Here are the current ranges for the three passes:

Pass	*Amp*	*Helium, cfh*
First	165	12
Filling	180	12
Dress	165	12

Joints for 90-deg pipe turns were held in alignment by four ½-in. tack welds. The tacks had to be cut out, not welded over.

Methods of Inspection

Chips were removed from completed nickel weld deposits. These were sent to the chemical laboratory for spectrographic analysis. In the beginning, the average iron contamination was only 2.50% for shop and ground welds. Later the percentage was even lower. Spot checks were made by gamma-ray inspection on the ground subassemblies. Weld quality was good: the welds proved to be sound and free of defects.

Samples of welds taken from the nickel-clad tanks showed excellent control of iron contamination. Here is an example:

Weld No.	*% of Iron*
10A	2.44
11A	0.96
12A	0.59
13A	0.71
9B	1.19
10B	0.38
11B	1.46
12B	3.29
13B	1.26
14A	0.73
14B	0.55
15A	0.48
15B	0.56
16B	0.35

At first, everyone at the shipyard had the impression that keeping the nickel cladding under the 5% iron contamination would be a feat almost beyond human capacity. However, that problem was licked quickly by just finding out the facts and then developing the proper welding procedures.

One of the remarkable things about this job was that only eight weldors were required to do all the fabricating on the tanks. And they did so well that no welding had to be done over.

Photos courtesy Nelson Stud Welder

CABLES up to 350 ft long were needed to carry power from three battery-operated welders on the ground to sites near the top of the 225-ft sphere

"Atom Apple" gets skin

IMAGINE a towering steel sphere 225 ft in diameter bristling with steel pins that cover it like the quills on a porcupine's back. That will give you the picture of the huge stud-welding job, nearing completion at the present writing near West Milton, N. Y.

The "pins" actually are headless insulation studs 2½ in. long. A quarter of a million of them are being stud welded to hold the 2-in. layer of "Foamglas" insulation over the entire 159,000 sq ft of surface of the sphere.

The big sphere will be used to test a prototype of the nuclear-powered submarine (Mark A) by the General Electric Co., which operates the Knolls Atomic Power Laboratory for AEC. Holding a volume of 5,964,600 cu ft, the sphere is the largest ball ever to be built by man. It has 26 times the volume of its nearest competitor.

Despite the awkwardness of working on a spherical structure that rises higher than the average 14-story building, six men armed with semi-automatic stud-welding guns have been installing the fasteners at record speeds. The lightweight (5 lb) plastic guns used for welding drew their power from portable battery-operated welders on the ground. Cable lengths up to 350 ft were required to reach the top of the structure. Two stud-welding guns were served by each of the three welders on the ground far below.

The job was done from the top down, with the stud-welding crew leading the way. The stud weldors were followed by the men who impale the "Foamglas" over the studs. Stainless-steel "speed clips" were installed over the studs to hold the material permanently in place. The tips of the studs were then snipped off, and the surface was covered with glass fabric and a weatherproofing mastic coating.

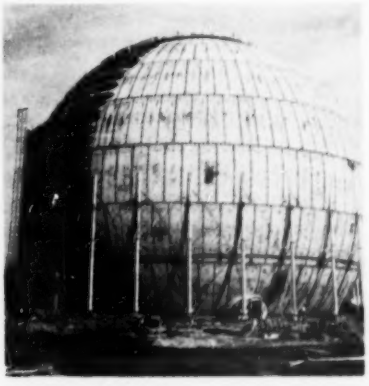
The saving in time effected by stud welding has been estimated at something more than 50% of the total time required for installation of the insulation block.

The sphere was designed by Clifford M. Orr, research department of Chicago Bridge and Iron Co., and was built by this firm under sub-contract from Rust Engineering Co., the AEC's prime contractor. Lewis & McDowell, Inc., New York City, was given the insulation contract.

As reported in THE WELDING ENGINEER for July, 1953, the sphere will hold the prototype of an atomic-energy-driven submarine propulsion unit. Besides housing the nuclear power plant for the submarine that will never go to sea, the sphere constitutes another safety precaution. Even though all of the numerous safety devices customary for nuclear power plants should simultaneously fail to operate, the radioactive fission products would be confined inside the sphere.

SPHERE is supported by 26 wind columns. You can see top of one on the right, where gun is being used

VIEW of one of the "ports" at base shows how 'Foamglas" insulation was applied to steel plate

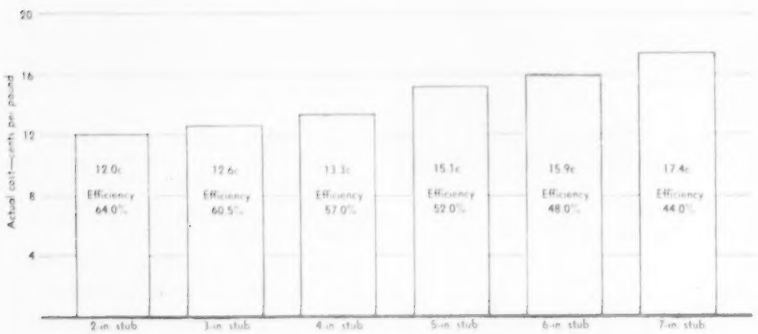


SOME 159,000 sq ft of surface on the sphere had to be covered with the stud-affixed insulation

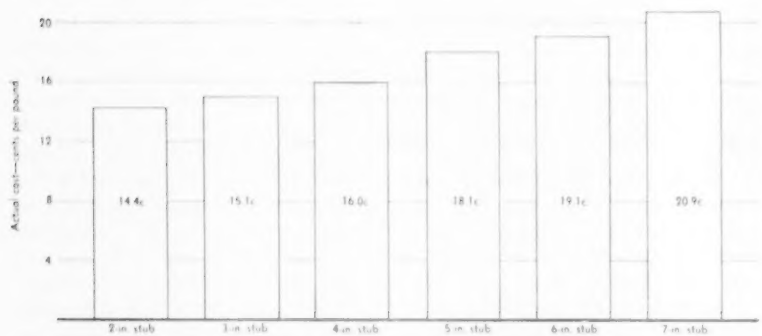
Are you getting the most from your electrode dollar?

These charts depict how four little habits of carelessness may be costing you real money in electrodes.

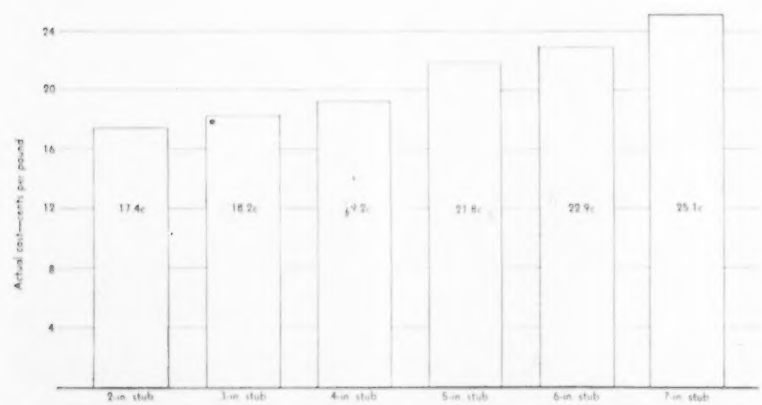
BY M. O. MONSLER
Manager, Welding Equipment Div., Harnischfeger Corp., Milwaukee



1—TAKING a 2-in. stub and a cost of 12¢ per lb as basic, this chart shows how longer lengths of stubs can shoot up the electrode cost figure



2—OVERWELDING has now been added to the stub losses in chart 1. Instead of a 5/16-in. fillet (as in chart 1), an 11/32-in. fillet weld was made



3—USING a ⅜-in. fillet instead of a 5/16-in. fillet really makes a difference. Metal deposited has increased by 44.3% from this overwelding

AFTER visiting hundreds of welding fabricators throughout the country during the past four years, the writer has become convinced that he has some ideas regarding the cost of welding electrodes that ought to be put on paper. Most fabricators are not—very definitely not—getting the most that they can out of each electrode dollar.

Electrodes don't cost very much when you consider the job they do. The original cost of the electrodes is but a small part of the end cost to the welding fabricator. Nevertheless, where savings are possible, they ought to be made. And the wasteful welding habits that are being condoned by the majority of welding fabricators are multiplying their electrode cost to a figure, in some instances, four times what was originally paid for the electrodes.

There are four little habits of carelessness by which electrode costs are being allowed to mount up. These are:

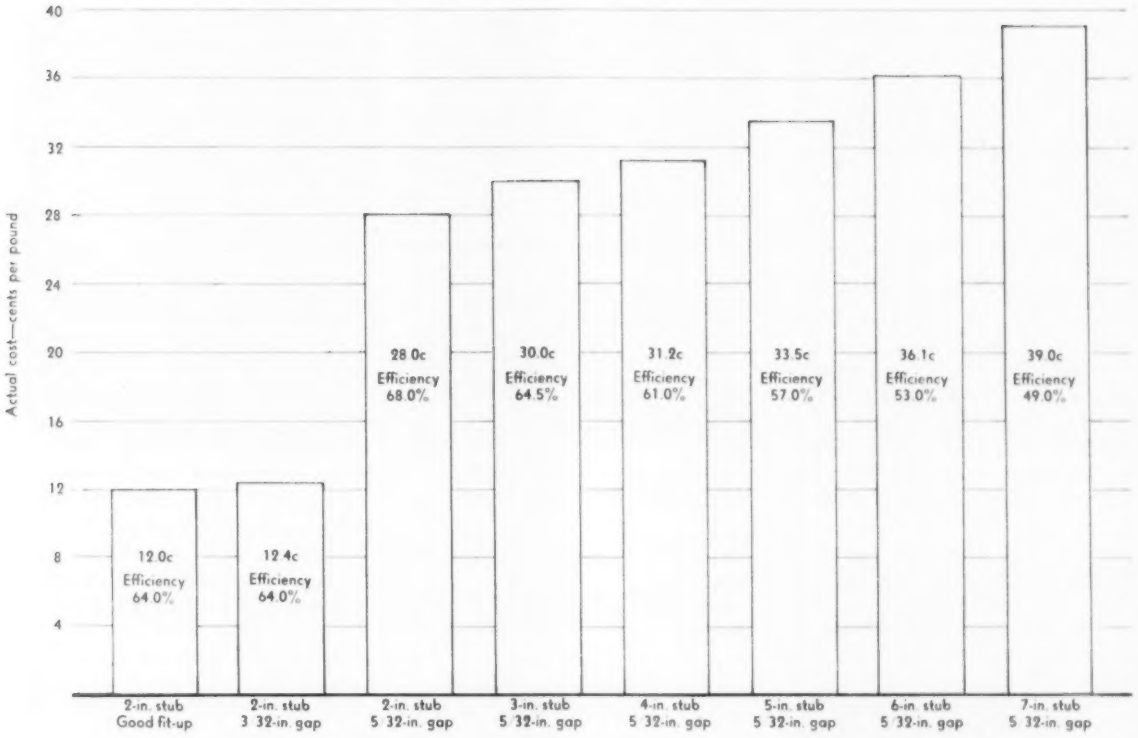
1. Stub losses.
2. Overwelding.
3. Poor fit-up.
4. Welding out of flat position.

I do not mean to say that each and every fabricator is guilty of all four of these wasteful habits. I do insist, however, that each and every fabricator is guilty of allowing at least one of these four sins to be committed in his plant. And in many plants you will find more than one being practiced regularly.

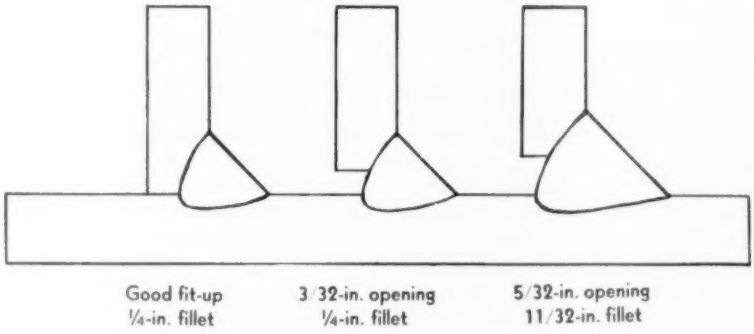
Let's take each of these wasteful welding habits in turn and determine its effect upon your electrode dollar.

1. Stub losses

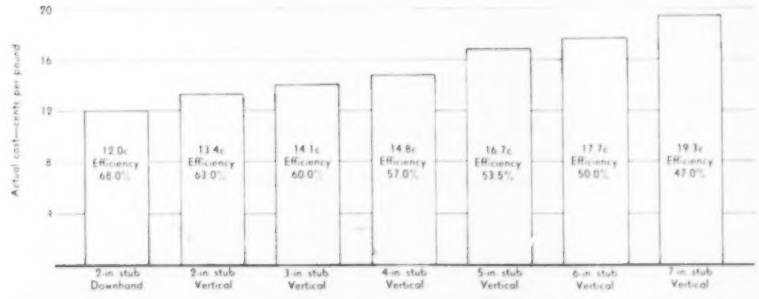
The waste involved in this one item alone accounts for a 30% increase in the cost of the fabricator's electrodes. Let's look at chart 1. This shows the results of stub losses when welding a 5/16-in. fillet with a 1/4-



5—COSTS soar when effects of poor fit-up are added to the stub losses and overwelding losses. The largest opening was only 5/32 in.



4—GOOD and bad fit-ups. These drawings will prepare you for chart 5



6—VERTICAL welding contributes its mite. Though the figures do not differ too much from the stub losses alone (chart 1), they are larger in every bar

in. E-6020 electrode. Starting with a base price of 12c per lb, the price per pound increases as the stub size increases. A 7-in. stub may be out of the ordinary, but look at the loss with a 5-in. stub! (And you would be surprised at the number of 5-in. stubs I have seen lying on the floors of welding shops.) The 12¢ cost per lb increases to 15.1c per lb. Suppose the welding department is using 40,000 lb of electrodes per month. They are actually throwing away $1,240 per month in stubs. Rigid inspection and supervision are the best means of controlling this waste.

2. Overwelding

This is an extra cost item that creeps into almost every welding shop and then grows and grows and grows. Most of the time it results from a lack of proper instructions (or incomplete instructions) on the shop blueprint or drawing.

Chart 2 shows the results of overwelding just 1/32 in.—making an 11/32-in. fillet where a 5/16-in. fillet was called for. Now look at the 5-in. stub loss on this chart, which also includes the overwelding cost. We have jumped another 3c per lb and are up to 18.1c per lb. Just by allowing an extra 1/32 in. on the fillet. Well, the difference between a 5/16-in. and an 11/32-in. fillet is very small. Most inspectors and supervisors would overlook an 11/32-in. fillet. Perhaps it can be excused, but look at chart 3. Here really is an ex-

Table I. Accumulated Losses from All Causes

Stub	*Basic Cost*	*Stub Losses*	*Over-welding*	*Poor Fit-Up*	*Out of Position*
2-in.	12.0¢	12.0¢	17.4¢	28.0¢	29.4¢
3-in.	12.0¢	12.6¢	18.2¢	30.0¢	31.5¢
4-in.	12.0¢	13.3¢	19.2¢	31.2¢	32.7¢
5-in.	12.0¢	15.1¢	21.8¢	33.5¢	35.1¢
6-in.	12.0¢	15.9¢	22.9¢	36.1¢	37.9¢
7-in.	12.0¢	17.4¢	25.1¢	39.0¢	40.9¢

ample of inexcusable overwelding.

The bars of this chart show stub losses plus unnecessary welding—a 3/8-in. fillet instead of a 5/16-in. fillet. Believe it or not, this results in a 44% increase in weld metal! The next time you walk through a welding shop, take your fillet gage and you will be amazed at the number of 3/8-in. fillets that were made where 5/16-in. fillets were called for. This unnecessary overwelding can really be expensive. The 5-in. stub loss on chart 3, which includes the overwelding cost, has now reached the fantastic figure of 21.8c per lb.

I am beginning to understand why the management and cost departments of some fabricators say, "My welding electrode costs are too high!" They are right if they are paying 21.8c per lb for 12c electrodes. Why stop here, though? The next wasteful habit is even more expensive than overwelding.

3. Poor fit-up

"Look at that opening!" exclaimed the weldor. "You can throw your hat through it!"

Have you ever stopped to figure out what it costs to fill up such openings? I assure you it is many times the cost of the plate that was saved by cutting the piece too short.

Drawing 4 represents a 1/4-in. fillet weld made under conditions of (*a*) good fit-up and (*b*) a 3/32-in. opening. An 11/32-in. fillet with a 5/32-in. opening is also shown. These drawings will prepare you for chart 5, which shows the stub losses and overwelding costs combined with various sizes of openings.

Costs really do soar in this chart. And the opening used is never greater than 5/32 in.—very small according to some openings I have seen left in welds. Again look at the 5-in. stub loss! What's this? It has reached 33.5c per lb! Almost three times the original cost of the electrodes! And just a little more care in cutting, flame-cutting, shaping, better work, perhaps, by the set-up man and stubs kept down to 2 in. would save the user of 40,000 lb of electrodes $8,600 a month.

Table II. Low-Hydrogen vs. Mild-Steel 1/4-in. Electrodes

	E-6010	*E-7016*
Fillet required	5/16 in.	1/4 in.
Actual fillet	3/8 in.	1/4 in.
Efficiency	62.0%	57.0%
Lb of electrodes per ft of weld	0.125	0.205
Cost per lb of electrodes	13.0¢	15.5¢
Cost per ft of weld	5.5¢	3.2¢

4. Out-of-position welding

More and more welding departments are getting around to the use of positioners for welding. They are smart to use them, for positioners do save on labor, the expensive item of welding costs. The use of positioners will also help to lower electrode costs, but the saving is not as great as in the three previous examples. Chart 6 shows the increased electrode cost for vertical welding as compared to downhand, stub losses being included as before but not overwelding and poor fit-up.

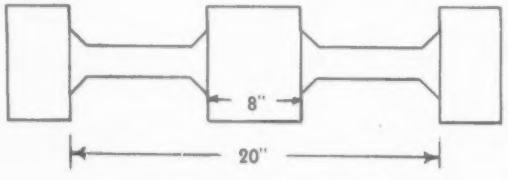
This chart is figured on a 5% increase in spatter loss. The 5-in. stub loss figure shows a gain of 3.2c per lb from the basic 12c. This figure will increase tremendously as the fillet size is increased. You can well imagine the effect when a 5/16-in. fillet is required. Downhand, the 5/16-in. fillet can be deposited in one pass with a 5/16-in. electrode. Vertical up or vertical down, a 3/16-in. electrode will have to be used, increasing the number of passes. In consequence, the electrode cost will be much higher.

Now, do you begin to see why there is so much conversation about electrode costs? Add up these flagrant examples of misuse and what do you get? You'll find the whole story summarized in Table I.

The columns of this table are on a cumulative basis, that is each item includes everything to the left of it. As an example, let's take the row with the 5-in. stub, which we have used all the way through this article as our particular example. The column headed "stub losses" also includes the 12.0c basic cost of the electrodes given in the previous column to the left. The column headed "overwelding" includes both the basic cost and stub losses. The "poor fit-up" column includes basic cost, stub losses and overwelding, while the "out of position" column also embraces poor fit-up, overwelding, stub losses and basic cost.

If you want to know the saving from just one item, all that is necessary is to subtract from the tabulated figure the item just to the left of it. For example, still taking the 5-in. stub, the stub loss column shows a

(Continued on page 53)



7—WELDED GEAR BLANK

14.66 feet of welding @ 5.5c per ft = 80.6c

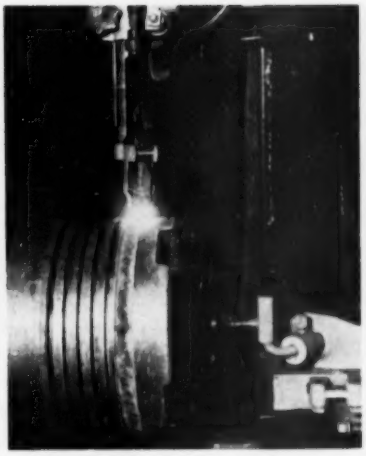
@ 3.2c per ft = 46.9

Savings in electrodes 33.7c

or 2.3c per ft of weld.

1—ELECTRIC hoist helps to put piston in lathe for rebuilding job

2—OPERATOR watches progress of welding through dark glass window



3—FRONT guard was removed in order to let this photo be taken

3-in-1 unit reclaims locomotive pistons

Equipment builds up two areas on aluminum pistons automatically and repairs cracks manually. All three of these jobs are done with the same Mig welding set-up.

PREHEATING, two different jobs of automatic welding and manual welding work are all provided in the notable 3-in-1 set-up for the reclamation of worn aluminum locomotive pistons at the Chicago and North Western Railroad's Clinton, Iowa, shops.

The versatile piston reclamation unit makes use of inert-gas welding of the consumable-electrode type, more briefly known as "Mig" welding. The rod feed and electrical control equipment stand on a cabinet a short distance away from the lathe where the build-up is done. One hose carries the rod, the electric cable, the feed and return cooling water and the argon gas. Starting from the control box, this multiduty hose runs over a floor stand, which supports it about six feet above the floor, before it descends to the welding pistol immediately above the lathe.

The 50-year-old-lathe was recovered from scrap to be rebuilt for this job. The ½-hp motor turns the piston by means of a home stoker worm screw mechanism and conventional belts and pulleys. The inert arc nozzle is inserted in a simple bayonet-type holder that can be raised and lowered by a ratchet adapted from a flame-cutting machine.

In photo 1, the weldor is lowering a piston into the lathe, where it will first be preheated. Valves for the compressed air and city gas used in preheating can be seen under the lathe. A hood and end-guard are placed over the piston to hold the heat while the 10-minute preheat is taking place.

Welding Commences

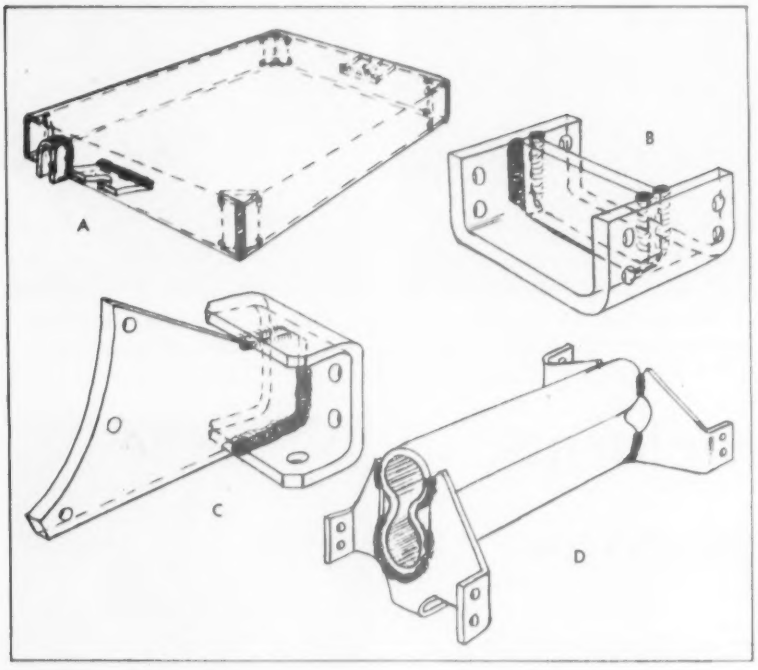
While welding is underway, the weld area is surrounded by canvas and steel guards, as shown in photo 2. In this picture, the operator is reaching up over the rack to adjust the distance between the work and the welding gun. He has to watch the work through the dark-tinted glass window. With the front guard open, the welding appears as in photo 3.

(Continued on page 66)

4—SAME set-up is used to weld piston crown; compare with photo 3

5—WELDING gun is lifted from the holder and employed manually

Practical design



Here are four products that were designed by the principles Mr. Cleveland sets forth in this series of down-to-brass-tacks articles for the practical designer of weldments. They are: (A) a weldment to replace a casting of a tractor battery cover; (B) a torsion-tension member for a tractor hitch extension; (C) a bending-torsion member for mounting a tractor drawbar and (D) a rigidity member for combating tractor frame torsion.

BY REX CLEVELAND
Design Engineer, Minneapolis-Moline Co., Louisville, Ky.

GOOD welding design means putting the right material in the right amount, in the right place. That's a simple statement, but how to do it is not so simple.

It is my purpose in this series of articles to tell you some of the basic things that a designer must know about welding. This first article will begin with a discusison of the right material. Next we will consider weld types and sizes and the strength requirements of members for tension, compression and shear loadings.

The second article will review the definitions and meanings of the various terms that you learned about once back in engineering school but may have since forgotten. Such terms as "moment of inertia," "section modulus," "modulus of elasticity," "ultimate strength" and the like can be made to come out of the handbooks and work for you. They express usable mathematical quantities that will help eliminate the guesswork from your design calculations.

The third and final article will go into the controversy of mild-steel weldments versus gray-iron castings. Tips that will help you to take advantage of the lower costs and superior properties of welded steel will be included. We will also look at shrinkage —often considered as a detriment to welding—and show how you can make it work for the design, instead of against it.

There's more to each article than the above, but enough has been said to give you a general outline of the series. I hope the idea appeals to you and that you will be with me for the next three months.

First the question of material.

Mild steel *is* right material for most applications. It excels from the standpoints of strength, deflection, availability, stock shapes and sizes, dependable physical properties, processing flexibility, weight and economy.

THINK OF IT AS A CASTING

Properly designed and welded mild-steel weldments produce solid, one-piece construction. Since the strength of the welds is greater than the steel, the weldments are as strong as the parts of which they are composed. Loading strengths are given in Table I.

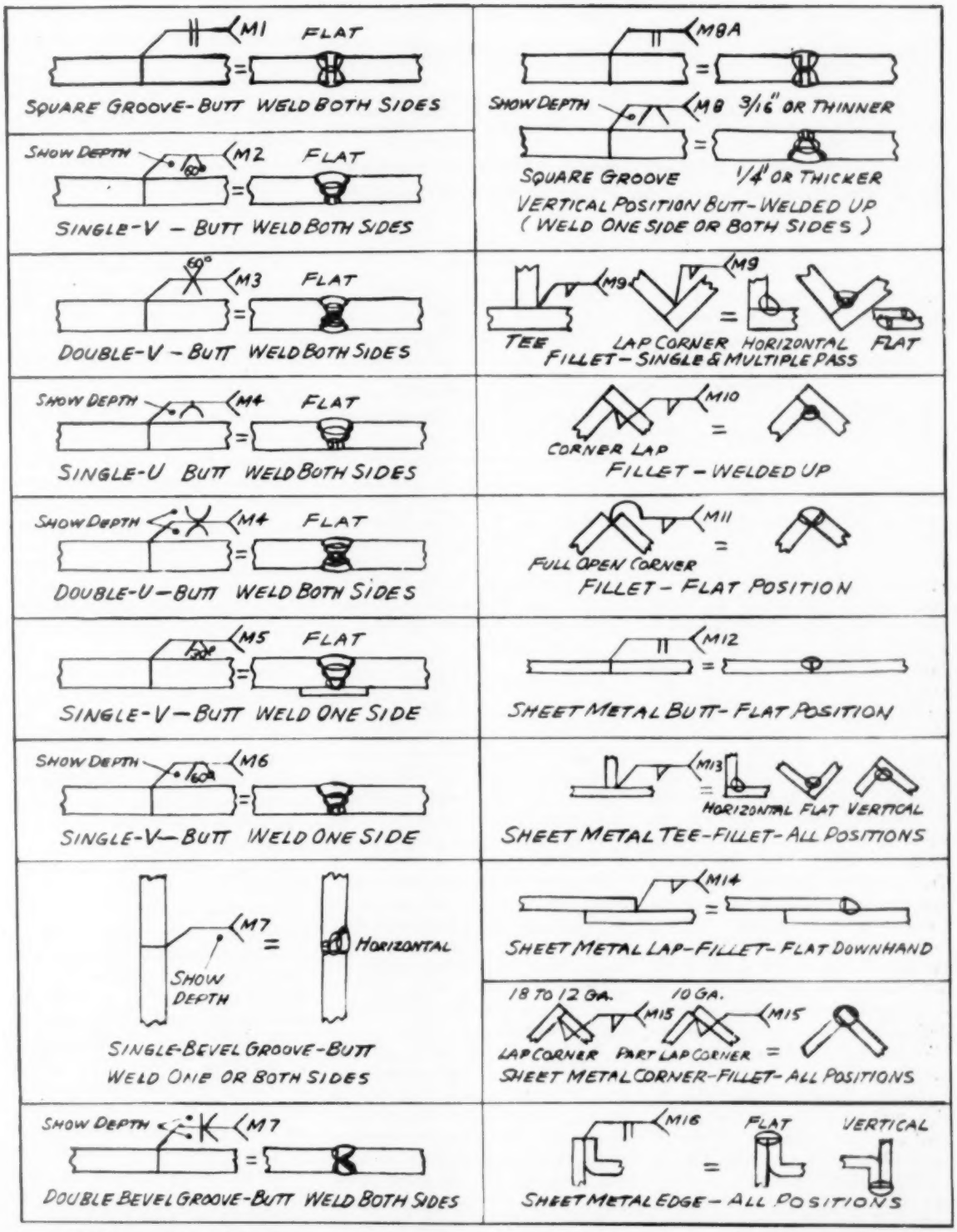
Mild-steel weldments can be most

Table I. Loading Strengths of Mild-Steel Weldments

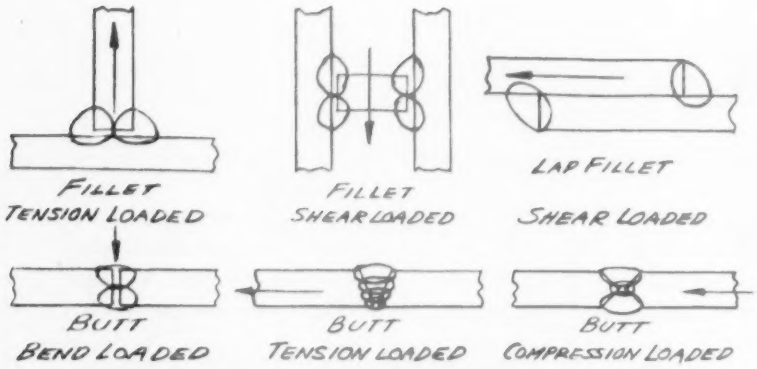
Type of Load	*Ultimate Strength*	*Normal Loading*	*Abusive Loading*
Tension	80,000 psi	40,000 psi	20,000 psi
Compression	80,000 psi	40,000 psi	20,000 psi
Shear	50,000 psi	25,000 psi	13,600 psi

The material for these articles was adapted in part from The Lincoln Electric Company's "Weldesign" course.

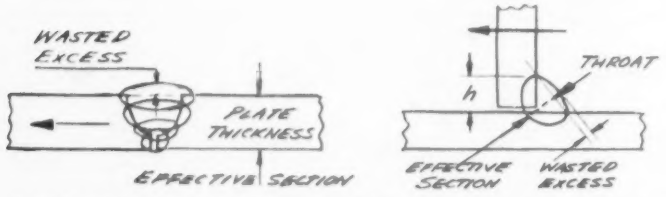
for welding–I



1—STANDARD weld symbols. Reference to these illustrations will help the designer in indicating the proper welds



2—WELDS required for shear, tension, bend and compression loadings



3—PLATE thickness determines the effective butt-weld section. To get throat dimension of a fillet weld, multiply leg height (*h*) by 0.707

aptly likened to medium-carbon steel castings (ultimate tensile strength, 70,000 psi). But there are none of the design limitations imposed by molding, such as draft and pouring requirements, restrictions on shape and section thickness, etc. Availability is far better, pattern cost is eliminated (or replaced by much less costly welding fixtures) and weldments can be produced in one's own shop without the capital outlay required for a steel foundry.

Thinking of the mild-steel weldment as a steel casting is a great help in designing. There is left only the necessity of designing for function, strength, welding and appearance. The limitations imposed by welding are very few, and in most cases can be made to work for you.

Once the functional design and the general appearance of the product, machine or structure has been determined, there remains only the designing of the parts, the subassemblies and the assemblies. Parts which contribute only to appearance (or protection) present no particular design problems. Planning for lowest cost and best process is all that is required. The proper weld for assembly is simply a matter of standard weld and procedure selection.

Once it has been determined that a weld is to be made (based on a comparison with costs of bending, forming or purchasing standard shapes) the next step is to determine the type. Reference to the illustrations of weld types in Fig. 1 will facilitate choice. The welding procedure is determined by the type of weld and its accessibility.

What Determines Cost

The designer should be well grounded in the functions of different types of welds and their comparative costs. In general, weld cost is determined by the following factors, in this order of importance: (1) accessibility, (2) type of weld, (3) size of weld. Here are some basic rules:

Easy access means cheaper and better welding. Make the joint to be welded as easy to get at with the electrode as possible. Accessibility means the avoidance of vertical welds, of welds in narrow crevices between parts, of welds inside tubes, underneath assemblies, etc.

The type of weld which costs the least is the one that requires the least plate preparation. Simple butt lap and fillet welds are the cheapest. Those that require costly beveling and gouging of plate edges, or difficult clamping, are the most expensive.

Welds requiring many passes to fill heavy cross-sections are also very costly. Cross-sections exceeding the strength requirements of the joint represent wasted money.

The designer should control the weld. Only in this manner can the desired results be achieved. To do this, however, he must know welding. He must know even more about welding than the weldor! This does not mean that the designer must learn physical welding, although it will do him no harm. What he must do is to study and understand weld types, welding procedures, welding techniques, welding time, welding fixtures and weld costs. Simply knowing the physical characteristics of a welded joint is not enough.

For the purpose of increasing one's knowledge of welding, reading of the better welding trade publications (such as this one), study of the better welding handbooks, observation of shop welding and even some welding practice will be of great help. One can never learn too much, and a little knowledge of welding can be a very dangerous thing!

Welds are composed of high-grade electric steel, stronger and better than the steel of which most weldments are made. If a weld is made in compliance with standard procedures, it is as strong as its cross-section at right angles to the direction in which it is loaded. This is the key to good welding design.

Design all welds for strength to resist the load to which they will be subjected. Standard procedure dictates how each type of weld should be made in order to place its cross-section in the most advantageous position to resist failure. Figure 2 illustrates the characteristics of each type of loading.

Effective butt-weld sections are determined by plate thickness. Fillet weld sections are determined by multiplying the leg height (*h* in Fig. 3) by 0.707 to get the throat dimension. Designs made for rigidity but not strength require only one-half the cross-section of welds for strength.

We must assume that the designer is capable of designing for proper function. This achieved, he must plan for strength. If the design members are to be weided, he must design for welding as well as for strength. This means that he must specify the welds that will provide the required strength of the welded parts.

Analysis of the function of the

parts will determine strength requirements. Applied mechanics will determine shape and section of weldment members. The shape and section determine weld requirements.

Since we are starting by using mild steel, many of the design factors are already known. For design purposes, mild steel and welded joints can be assumed to have the same physical qualities. Design factors that apply to the one apply to the other. These known factors (or properties) are:

Modulus of elasticity	
Tensile	30,000,000 psi
Torsion	11,600,000 psi
Tensile strength	80,000 psi
Compression strength	80,000 psi
Shear strength (or torsion)	50,000 psi
Elongation	31%
Brinell hardness	146

Strength requirements of members for tension, compression and shear loadings are obtained by the use of the well known formula: strength equals force over area, or $S = F/A$.

To give an example of how this formula is used, a bar of mild steel is required to support a normal tension loading of 100,000 lb (F in our formula). What size of bar should be used and what should be the cross-sectional area of a weld in the middle of this member?

From Table I, we find that normal tensile loading is 40,000 psi (S). So our equation is:

40,000 psi = 100,000 lb÷A
or A = 100,000 lb÷40,000 psi
= 2.5 sq in.

A bar 1 in. by 2.5 in. or ½ in. by 5 in. will support the stipulated load. If a square bar is wanted, it is necessary to extract the square root of 2.5. This is 1.5811 in. The nearest fraction equivalent to the decimal part .5811 is 19/32 in. so a bar about 1 19/32 in. square would be needed to support the load.

The cross-sectional area of a weld in the middle of this member would also have to be 2.5 sq in. If the square member is chosen, its perimeter would be 4×1 19/32 = 6⅜ in. Divide 2.5 sq in. by 6⅜ in. to get the throat of the weld, or 0.392 in. The nearest standard weld with this throat dimension is a ⅜-in. butt weld. It can be made with a single pass by using a ⅜-in. electrode. Thus do we arrive at the proper weld for the job.

NEXT MONTH: *Mr. Cleveland will give you a refresher course on some of the things you learned in engineering school that can be made to work for you.*

ELECTRODE LOSSES

(Continued from page 48)

figure of 15.1; subtract the base cost of 12 from this, and you get 3.1c. This is the stub loss alone. For the third column, 15.1 subtracted from 21.8 gives 6.7c as the cost of overwelding. For the fourth column, the arithmetic is to subtract 21.8 from 33.5 to get 11.7c, the cost of poor fit-up. Similarly, the cost of out-of-position welding is found to be 1.6c. Add 12, 3.1, 6.7, 11.7 and 1.6, and you will get 35.1c, the cumulative total given in the last column.

The 5-in. stub figure can come to as high as 35.1c per lb for electrode cost, surely a terrific price to pay for a 12c per lb electrode. Nuf said! Let's get on to a more pleasing topic.

Low-Hydrogen Electrodes

Not too many people are aware of the savings possible through the use of low-hydrogen electrodes. Disregarding the higher welding speeds, just what can you expect in electrode material savings? Table II is only one of many comparisons that could be figured. On a great number of weldments calling for a 5/16-in. fillet, you will find the welding department actually applying a ⅜-in. fillet. Why? You will discover that as a result of failures due to cracked welds, the foreman or superintendent has recommended a larger fillet to offset the cracking problems. Most of these problem welds are a result of off-standard steel. Instead of licking these problems with oversize welds, the use of low-hydrogen electrodes will do the job better and cheaper.

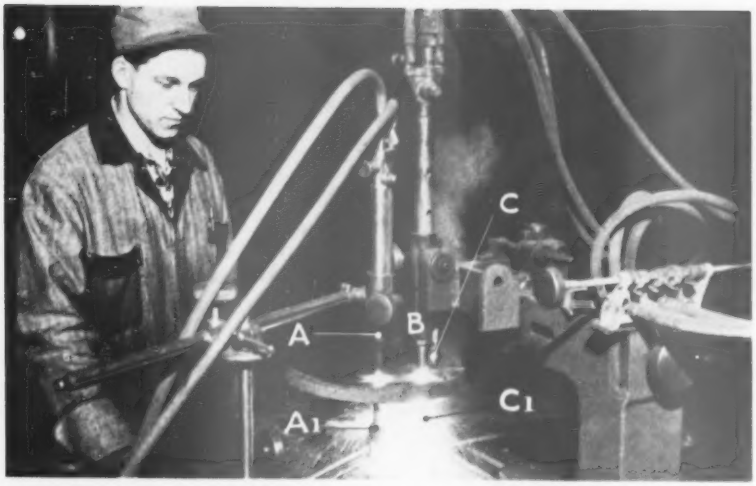
Look at the results in Table II. A ¼-in. fillet with the low-hydrogen electrode (E-7016) will give you the necessary strength required of a 5/16-in. fillet. On top of this, you will not be prone to overwelding due to cracked weld failures. On each foot of welding you will save 2.3c. On a job requiring 100 ft of welding, this means an electrode saving of $2.30. That can mount up to real money on a production item.

As a specific example, let's look at the welded gear blank in drawing 7. It calls for a total of 14.66 ft of fillet welding. Using an E-6010 electrode and making 5/16-in. fillets, the electrode cost at 5.5c per ft is 80.6c. When welded with class E-7016 electrodes, and ¼-in. fillets, the electrode cost on the same gear blank is 3.2c per ft or a total of 46.9c. The saving is 33.7c per gear; divide this by 14.66, and you will find that you are saving 2.3c per foot of weld.

Go back to Table II, and you will find that the above saving is in spite of the fact that the original cost of the E-7016 electrode is 2½¢ per lb more than the E-6010 original cost.

In closing, I would like to emphasize that it is not the original electrode cost that hurts; it is the accumulation of expensive wasteful habits in the application of electrodes. Couple this with the reluctance evidenced by many shops to use what they term "new-fangled ideas" (such as low-hydrogen electrodes), and you will see why most fabricators are not getting the most from their electrode dollar.

"Now maybe the welding lessons can proceed with a little less yackity yack."



1—THIS is the machine. Gear blank, turning clockwise, is preheated by torches labeled A and A_1. Torch B does the flame-cutting of the teeth; C and C_1 indicate the positions of quenching sprays at the top and bottom

Gears hardened as they are flame-cut

Here's a neat idea for combining flame-cutting and flame-hardening in a single operation. The hardness zone can be precision controlled to meet specifications.

BY GLENWAY MAXON
Cogmatic Co., Milwaukee

A NEW method of precision flame-machining steel gears and sprockets promises significant advantages in both economy and speed of manufacture as well as close control over deep case hardening.

Basically, the development is a refinement of a flame-machining process. A water quench was originally used to prevent distortion from heat. As a by-product of this initial process, it was found that the quench materially improved hardness and wearing qualities of the finished product, even with steels of low carbon content.

No Harmful Effects

The hardening was a result of carbon migrating into the flame-machined surfaces during cutting. Metallurgical studies of such surfaces showed that the alloy steel materials were not burned, nor of an undesirable grain size, nor in danger of checking. On the contrary, the flame-machined surfaces were found to be hard and under compression stress. Gear teeth so hardened were ideally suited for rough, tough and dirty operations.

Further development has led to a method whereby flame-machining and deep case hardening are combined in an automatic operation. The new process permits substantial increases in the depth of the hardened surface; it also enables the hardness to be localized to specific tooth areas where wear will be most severe.

It Works This Way

(1) As the steel blank that is being flame-machined slowly revolves, torches from above and below preheat the blank at such radius from the center as to localize the "deep case" in the area wanted. The machining flame, when it passes through the preheated area, is thus able to increase its range. It heats to critical temperatures at greater distance from the flame, thus increasing the amount of metal susceptible to hardening.

(2) Immediately following the machining torch, quenching takes place. This quenching may be violent, with full streams of water, or gentle, with fine sprays of water, or air combined with water in a mistlike spray. The quench can be directed to the parts where extreme hardness is wanted, while other parts can be allowed to cool more gradually and become tempered.

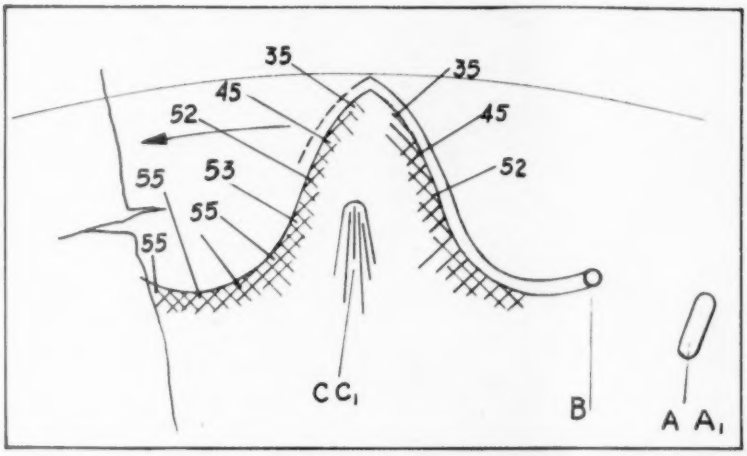
Let us now look at the equipment. Photo 1 shows the machine operating to harden gear teeth at the same time they are being flame-cut. In this photograph, the gear blank is turning clockwise and is receiving booster heat from torches A and A_1. After the blank has been well heated by these booster torches, torch B is ignited to do the cutting. Immediately behind torch B follow sprays C and C_1, which quench and harden the steel above and below in the desired zones.

Zones Can Be Selected

The booster flame and the quench can both be directed on the areas where hardness is most desired, and the booster elements can be turned off and on by the same automatic sequence that activates the flame-machining torch. This ability to localize hardness promises to be a great asset in producing heavy-duty gear teeth. Such teeth normally require hard flanks, while the tooth points should be tough and not brittle. Similar variety in specifications is found in sprockets for armored tanks and tractors. The tooth surface is required to be very hard on the flank and root, but hardness is *not* desirable in the section left open for dirt clearance.

The selectivity of hardness is not limited to heavy-duty gears and sprockets. The same advantage can be applied to any symmetrical shape in which only certain areas are subject to wear. Ratchets, rough-duty cams, crusher parts and many other types of parts may be made and hardened by this method.

Figure 2 is a diagram of what takes place on a typical gear tooth. AA_1 represents the zone of preheating on the top and bottom of the gear blank. B indicates the flame-cutting torch; it is followed by two parallel curved lines, which represent the kerf left by the oxygen stream. C and C_1 show



2—PROFILE of gear tooth cut by machine and method pictured in photo on opposite page. Figures indicate Rockwell C hardness readings, spaced at ½-in. intervals 1/16 in. back. See text for explanation of the letters

the quenching spray. The cross-hatching indicates the hardened zone, which extends a minimum of 3/16 in. from the flame-cut surface of the tooth. The numbers are Rockwell C hardness readings, which were taken every half inch at a distance 1/16 in. back from the flame-machined surface. This is a typical hardness pattern for a 1345 steel sprocket.

A remarkably wide range of depth of hardening can be achieved. The tooth area can be brought up to the critical temperature as much as an inch below the root radius or left at 1/16 in. Patterns of hardness are now being cut 3/16 in. deep, with hardness varying from 55 Rockwell C down to 35 Rockwell C, all controlled by the booster torches and quenching. The steel, of course, must be capable of being treated to that hardness. Steel such as 1030 may be given a light case from 0.010 to 0.060 in. thick, while steel such as 1345 or 1350 (which are very tough to machine cold) can be hardened to 55 C at a depth of 1/16 in. from the face of the cut. The practical maximum depth of hardness from the flame-machined surface has not been determined.

Gears Cut in Sections

Design engineers are not hampered by such problems as purchasing special cutters for special gears or making patterns for special gears or sprockets. Tooth forms can be selected at the choice of the engineer by simple change-over of a cam, with hardness pattern being similarly controlled. Each cam is capable of generating its particular tooth form for any pitch of tooth.

An example of economical flame-machining and flame-hardening is shown in photo 3. The specifications called for seven gears of 2 diametrical pitch, 70 teeth each. The face of the gear was to be 4 in. thick, which posed a problem as this thickness is too great to be flame-cut to the desired accuracy. In order to obtain maximum accuracy, the 4-in. face was made up of three laminated sections. The inside lamination was flame-cut from 1½ in. plate, and the two outside sections were cut from 1¼ in. plate. All three sections were of 1045 steel.

To prevent distortion and incidentally to case harden, a small stream of water was directed on the plate following the cutting torch. The 21 gear sections produced were so uniform that when they were assembled in sets of three, the teeth matched with exact profile conformation. Any three sections could be matched together, and inversion or rotation of individual laminations made no difference to the tooth line-up since there was no accumulative error of tooth spacing.

The outside sections were flame-cut into rings to save weight and fillet welded to the inner section, which was left in the form of a solid disc. After spot-tacking the three sections together, they were skip welded to prevent distortion. The resulting gears were hard and very serviceable.

Done in Nine Hours

Though this job appears to be difficult and complex, the fabrication took only a short time. The actual flame-cutting with simultaneous quenching took less than nine hours on the machine. The nine hours included setting up, changing work, cleaning up the machine, etc. The elapsed cutting time was approximately 19 minutes per piece or six hours 39 minutes for all 21.

Oxygen consumption totaled about 50 cu ft for each piece, acetylene about 9 cu ft per piece. The total cost of flame-machining was thus very low indeed for a job of this nature.

Had booster flames and spray quenching been added for the purpose of deepening and controlling case hardness, it would have involved no more than additional set-up time of a few minutes and from 50% to 100% increase in gas consumption.

3—PRECISION flame-machining. Each of these gears was made by flame-cutting three sections so teeth would match, then welding them together

Brazing in action*

Everywhere you go in the United States, you will find brazing in production. Here are examples from seven manufacturers to show how it's made to pay.

Long before the time of Julius Caesar, the Etruscans recorded the first known brazing alloy and flux formula: minute grains of gold were placed in joints and mixed with an organic gum and copper salt. This ancient art somehow became lost to the western world. Brazing was known to India and China, however, and the long-lost secret was brought back to Europe by adventurous Dutch traders about the time of Columbus.

By 1740, brazing by coppersmiths was known in England, and from there the techniques were introduced into America. When, in 1865, the famous Atlantic Telegraph Cable broke in mid-ocean, the brazing process (loosely called "silver soldering" at the time) won short-lived international attention. Outside of jewelry establishments, however, brazing was pretty much ignored for many years. How different today!

In the jewelry field, manufacturers find that a manual torch operation is still the quickest and most profitable. At Henry Gorman & Son, Inc., Providence, R. I., jeweler, girls use very thin wire of silver-brazing alloy with an almost-invisible flame. Each day, they turn out hundreds of complicated, very fine but strong joints.

The Avien Instrument Corp., New York City, in manufacturing to military specifications, had the problem of joining metals in an assembly that must maintain exact linearity of three parts.

Brazing solved this problem in two ways. First, the joints could be bonded at a low temperature, thus preventing heat distortion. Secondly, low-temperature alloy brazing rings could be placed on the underside of the assembly, because the molten alloy was drawn *upward* into the opening.

Capillary Action

All good brazing is made possible by a little understood law of physics that is known as "capillary action." Capillary action is the physical force that draws the melted wax of a burning candle upward through the wick to keep the flame burning. The same force is at work in brazing. In a properly prepared joint, the alloy is drawn completely into the required space in order to join the parent metals. If the joint was prepared poorly, however, the alloy cannot do the proper job of bonding. The law of capillary action must guide every phase of brazing design, technique and alloy selection.

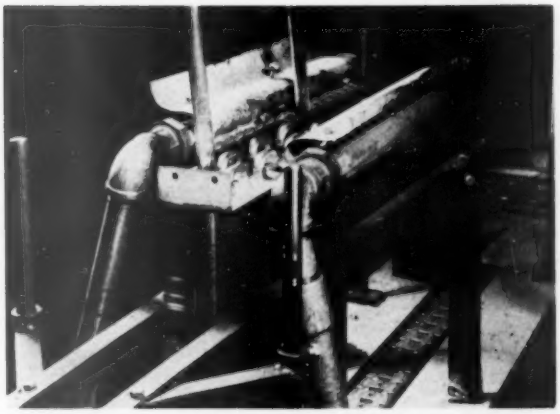
A major manufacturer of electrical equipment found that low-temperature brazing is the only method that can reliably bond extremely fine wires together and not have them burn up in the operation. In this case, the twisted wires are hand dipped into a pool of molten silver alloy to secure the connection. A small sprinkling of flux on the pool cleans both the wire and the alloy.

Today, almost every industrial metal except aluminum can be firmly brazed at low temperature. Cast iron is included and likewise high-nickel steel.

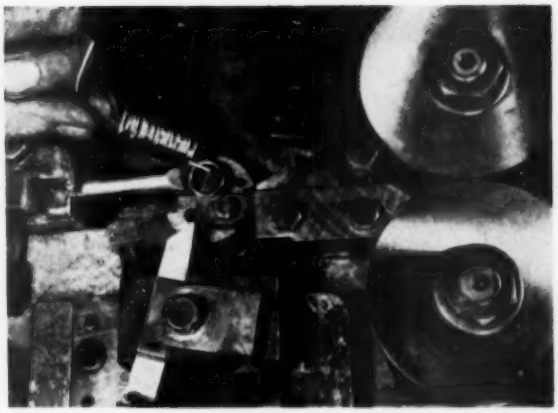
Three Metals Joined

Lindy Heaters, Inc., New York City, joins three dissimilar metals—steel, copper and brass. It's done in a single operation. On a specially designed turntable, the fluxed and assembled parts are rotated over a series of five city-gas burners. These evenly heat the entire assembly to

*Photos and text adapted from a 16-mm color-sound movie, "When Metals Are Brazed," produced by United Wire and Supply Corp., Providence, R. I.



BRAZING copper U-bends to refrigeration coils in a continuous chain-belt operation at the Bush Mfg. Co.



RINGS, all sizes and wire diameters, are machine produced to make the job on the brazing bench easier

the flow point of the alloy, which amalgamates the three parent metals into a single joint.

Ranco, Inc., Columbus, O., manufacturer of switches and thermostats, turned a complex, multi-unit joining job into a high-speed operation through proper brazing. The task was to join together several elements of a control unit: a primary and a bypass tube, an inside flow control and a base. Three separate joints are now brazed with only two preplaced alloy rings. Reduced costs and better performance were the results of these changes.

Bush Mfg. Co., Inc., West Hartford, Conn., maker of refrigeration and air conditioning equipment, brazes 24 alloy rings on copper U-bends in a single straightline operation on a refrigeration coil. Inert gases inside the coil prevent any oxidation during the automatic brazing process.

Testing each assembly at 300 psi, Bush reports only three rejects in 7,930 joints!

Royal Typewriter Co., Hartford, Conn., uses brazing to produce tens of thousands of office machine parts each week. Steel is brazed to steel with silver alloy. Royal's own toolmakers design and build special jigging machines combined with induction coils to form typewriter parts to exacting positioning. These jigs do so much of the precision work that even totally inexperienced girls learn to braze the units after only three days of training.

The finished joints are 400% stronger than normal hard use requires and are so smooth that they need no grinding nor polishing.

Tips on Brazing

The butt joint and the lap joint are the two basic brazing designs. The lap joint is most commonly used and recommended. Long parallel surfaces permit capillary action to cover large areas of the parent metals.

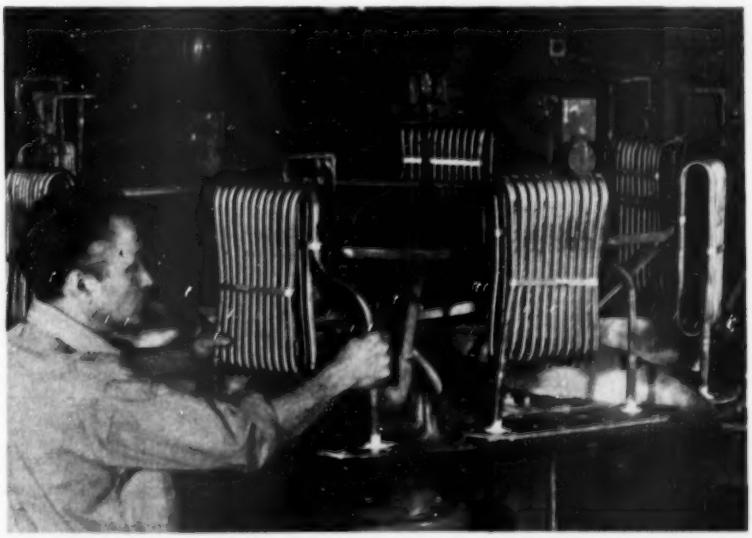
Butt joints eliminate extra thickness and are practical where maximum strength is not required. Butt applications requiring strength can be designed as lap joints for highest possible mechanical strength.

After proper design and shaping, the first basic step in technique of brazing is the removal of chips, dirt, grease and oxidation from the parts to be joined. Simple mechanical cleaning is completely satisfactory, but for production, acid or vapor cleaning may be quicker. In any case, the parent metals must be free of any impurities.

Fluxing is the next important step. It protects the joints against oxidation and it also "wets" the surfaces to control and direct the liquid alloy.

At this point, the importance of good design is again evident. Clearances between the metal surfaces must range between one to five thousandths of an inch, depending upon the thermal expansion of the base metals. Also each joint must be "vented" so that gases can escape and the molten alloy can float out fluxes and oxides.

In general, all these elements of design and technique are easy to practice. Basically, the operation that looks right is right.



FLUXED and assembled units are rotated over a series of five city gas burners that heat each assembly to the flow point of the brazing alloy

1 PICTURE sequence shows a casting getting "the works." Here the weldor is gouging out a groove

2 WELDING gets under way. Improvised asbestos shield on torch indicates that job is a hot one

Here's the way Storts Welding

It's the good old-fashioned way with the oxyacetylene torch and cast-iron filler rods. Admittedly, it's the hard way of joining the fractured parts of a casting. It calls for a crew of trained specialists, continuous welding and extraordinary care in preheating and cooling. But it produces a weld structure that can hardly be distinguished from the structure of the parent metal.

BY HAROLD S. CARD

WHEN fusion welding of cast iron was first proved to be practicable and successful, the proponents of welding felt that they really had something. This brittle material had always been considered unweldable. So the oxyacetylene welding torch became the first great miracle tool of the Twentieth Century. It took a few years to learn the possibilities of the process, and the pitfalls, and to work out satisfactory techniques; but once they were established, these techniques have continued in use—to the gratification and profit of many owners of castings.

This first successful method of welding cast iron still does a complete job. It is the usual method used by Storts Welding Co., Meriden, Conn., to reclaim broken or defective castings of gray iron.

Although the Storts concern is primarily a fabricating shop, facilities are maintained for the repair welding of heavy castings, largely as an accommodation to customers. Many of the customers have maintenance welding crews, which can handle the ordinary run of repair and salvage work. It takes a crew of specialists, however, to do welding on heavy-duty presses and large gears—parts that are subjected to rugged dynamic loading.

It is a type of work that does not pile up in the shop. Weeks may pass without any cast iron being welded. When such jobs do turn up, however, they are always wanted in a hurry. And at Storts a crew of expert operators is always available—men who are skillful with both torch and arc and who are accustomed to working together on first aid to injured castings.

Early in the history of this company, it was decided to standardize on a single method of welding cast iron. Oxyacetylene welding with cast-iron filler rod was the choice. Other methods, reputed to be faster and cheaper, were in vogue then, and still others have since appeared on the welding scene. They all have their merits. The preference shown at Storts for the gas welding process is based on a desire to turn back to the customer a casting that is truly homogeneous.

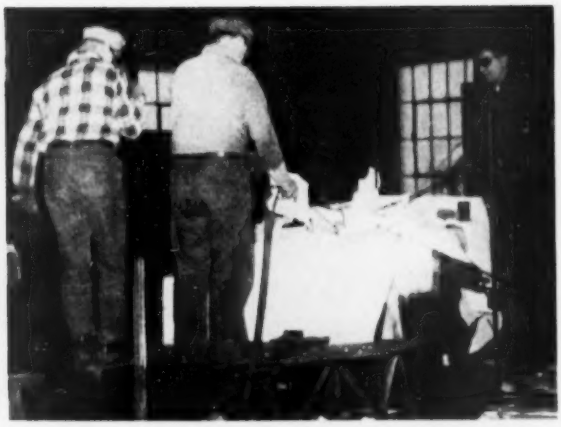
Castings of the heavy-duty type are generally of very good quality, as evidenced by a relatively dense, fine-grained structure. The same characteristics are found in weld deposits made with cast-iron rods of good quality. If the weld is made right, it, too, is composed of good quality cast metal, blending into good cast metal of similar composition.

Gas welding is admittedly the hard way, but it gets a kind of result which is physically impossible with any other process. This kind of result has won a reputation that brings broken castings to Storts from cities and towns hundreds of miles away.

Preheating and Cooling

The success of a gas weld in cast iron depends upon "before and after" precautions: preheating and controlled cooling. If preheating is managed so that no cold metal of the workpiece is permitted to chill the weld deposit, then there is no metallurgical notch left in the weld

3 RELIEF man in the plain shirt steps up to take over the welding. There can be no pauses or halts



4 PLAIN shirt is now on the job. Shift was accomplished so smoothly hardly a motion was lost

repairs heavy iron castings

zone. And if the cooling of the piece is properly controlled, there will be no hard spots.

Preheating is here somewhat different. Instead of the firebrick and charcoal oven that is used by the average welding shop, Storts has a gas furnace with perforated pipe burners embedded in refractory lumps. This serves for preheating the occasional small casting and is also useful for preheating tools and dies, which are frequently brought in for repair by the atomic-hydrogen welding process. The furnace is an excellent means of obtaining a controlled preheat on castings of small and medium size. Parts under preheat are covered with asbestos paper, which can be partly removed for welding. The asbestos can be quickly replaced when the job is finished to assure slow, even cooling.

Larger castings, such as big press frames, are preheated with heavy duty oil-burning torches. The piece is set up in whatever position is judged most advantageous for grooving and welding; a study is made to determine the areas that should be heated; the torches are positioned to play the heat on these areas; then sheets of asbestos paper are placed so as to confine the heat to best advantage and protect the heated areas from drafts. Firebrick ovens are not considered practical for heavy casting work because they take so long to build and because of the need for turning castings during the progress of the work. Asbestos, they say, does fully as good a job of retaining the heat, and it takes only a short time to cover the largest casting.

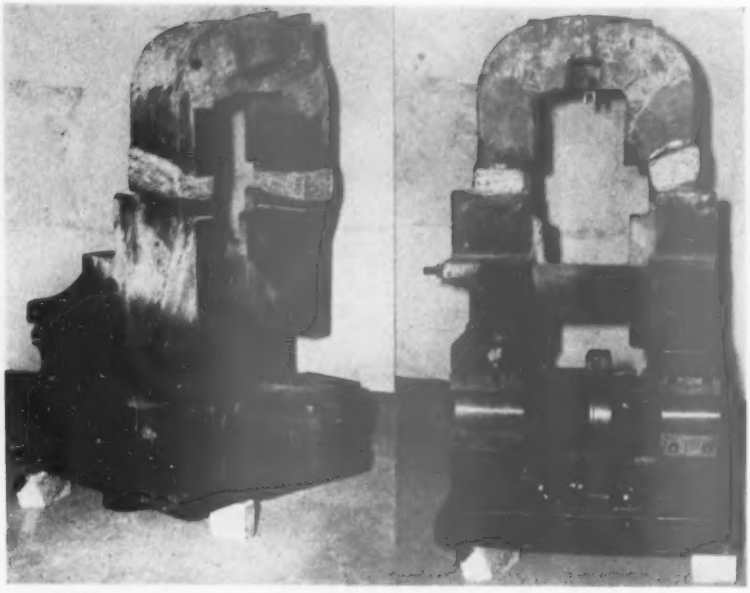
A typical sequence of operations was followed in the case of one casting, which is shown "getting the works" in photos 1 to 4. This large frame had been overloaded once before, causing a break in one of the main frame members. This break was successfully welded. A second overload fractured the two massive cross members. Inspection indicated that it would be entirely impractical to attempt to repair the frame in place.

While the press was being dismantled and brought in for treatment, preparations were being made for it. The space usually allocated to casting repairs was cleared, and all equipment and supplies were made ready so that work could start immediately when it arrived. Four men, all experts in this work, were selected for the welding crew. The job was described to them, and arrangements were made for them to be relieved from other work at the proper time. These men are accustomed to working together. Advance planning of assignments and schedules served to make sure that there would be no interruptions nor delays from the time the heating started until the casting was ready to be trucked away.

5—TEETH built up by oxyacetylene welding equalled the other teeth in this gear in every way

The casting arrived and was set in position. Asbestos paper was disposed around the frame so as to confine the preheat to the welding area and to the other areas that were heated to compensate for the expansion and contraction that go with heating and cooling. Some portions of the frame were heavily wrapped to shield them from the heat of the torches.

Once it has been started, the preheating arrangement practically runs



6—TWO views of a press frame job that presented a tricky problem of alignment. The welds have been chalked so they can be easily recognized

7—STEEL bars and long bolts do a simple but effective clamping job

8—DEFECTIVE castings sent in by a foundry for salvage. The trouble was that there were cracks in all the web members of these heavy machine bases

itself. Only occasional inspection is needed to make sure that burners are adjusted to bring the various sections up to temperature uniformly. When the welding area was nearly up to temperature, the asbestos covering was pulled away. Using his longest and largest torch, largest size tip and high oxygen pressure, the operator started to melt out a groove for welding. He melted the metal and blew it out of the groove. (Sometimes a heavy-duty cutting torch with a special cast-iron cutting tip is favored for this operation.)

Welding Was Continuous

As soon as the groove was completed, before the weld area could cool appreciably, the welding got under way. In this case, the extent of the fracture necessitated a four-man team, one pair at each end of the crack. They used heavy-duty torches and for much of the work they tacked ¼-in. cast-iron welding rods together to make a longer and larger filler rod. When the heating torches are going full blast, there is a limit to the time a man wants to spend working over the puddle; as soon as it got too hot for a weldor, his partner would take over. By working in relays this way, there were no pauses in the progress of the weld. Furthermore, uniform heating was maintained, a clean job of fusion was achieved and the men were not unduly exposed to the welding heat.

The entire crew had a bit of a breather while the casting was being turned to bring the opposite cross member into welding position. With this kind of team work, it is possible to keep a casting repair going until it is finished and have good fusion all the way. Naturally, this pleases the customer, who is anxious to get his equipment working again at the earliest possible moment.

Continuity of welding is important to the securing of complete fusion throughout the cross-section; it is necessary if laps, voids and other discontinuities in the weld are to be avoided. Combined with proper preheat, welding continuity is also effective in avoiding the development of undue stresses or of hardened areas near the weld zone.

One essential part of any cast-iron welding procedure is the preserva-

(Continued on page 66)

DISTRIBUTORS:

No need to worry over 1954 business

Members of the National Welding Supply Association, attending their tenth convention at San Francisco, get the lowdown on the present economic situation.

BY T. B. JEFFERSON

JIM Alcock, new president, NWSA

EXPERTS in economics from the American Trust Co., E. I. duPont deNemours & Co., Inc. and Dun & Bradstreet, Inc. told members of the National Welding Supply Association attending their tenth annual convention, in San Francisco, that there is no need to worry over business conditions in 1954, but—

The "but"depends a lot on what the distributors do themselves, to work out their own salvation.

Three hundred and sixty-eight distributors and manufacturers from all sections of the country attended the convention, which was held at the Hotel Fairmont, San Francisco, February 15 through 17. This, the first major convention of NWSA to be held on the Pacific Coast, was a gratifying affair from an attendance standpoint. All sessions were well attended, including the association's fifth Contact Booth Program, at which 58 exhibitors were represented.

Business Problems Analyzed

First of the visiting experts on economics to make his appearance was Lloyd E. Graybiel, vice-president of American Trust Co., San Francisco. Even though present inventories are high, the outlook for the future is good, said Mr. Graybiel. With personal savings at an all-time high, more credit available, lower interest rates at hand and lower taxes in prospect, there is no reason why prosperity should not continue at a near record high. The only dark spot in the situation is the increase in business failures. This Mr. Graybiel discounted as being due to inexperienced business operators who did not know how to run their businesses properly.

Dr. Walter A. Dew, E. I. duPont deNemours & Co., Inc., San Francisco, emphasized that industry will never have to worry about business conditions if it makes a product to fill a need, knows how to make it satisfactorily, meets and beats competition and continues to improve the product or process so as to make it better and cheaper. Said Mr. Dew: "Over 50% of the sales of our company last year were of products that were not even on the market in 1939."

Louis Marzluft, west coast regional reporting manager, Dun & Bradstreet, Inc., Los Angeles, had some thoughts to contribute on "Operating at a Profit in 1954." There is no reason why a business cannot make a profit in 1954, said Mr. Marzluft, if it is geared to the times. Inexperience and incompetence in management cause 83% of the business failures.

Panel Talks It Over

In keeping with this theme, a panel discussion on the subject of "How We Plan to Cut Costs and Increase Net Profit in 1954" was contributed by five NWSA members.

Robert G. Jackson, Jackson Welding Supply Co., Inc., Rochester, N. Y., pointed out how economies could be effected in the office. Glenn G. Garman, Purity Cylinder Gases, Inc., Grand Rapids, Mich., gave a detailed report showing how savings could be effected in trucking costs.

J. M. Robinson, Robinson Welding Supplies, Inc., Detroit, discussed purchasing economies. John R. Morrill, Gibson Welding Supplies, Inc., Spokane, Wash., told how economies can be effected in selling without impairing the sales effort. The final member of the panel, A. S. Owen, of H. M. Parker & Son, Glendale, Calif., talked briefly on warehousing economies.

The next annual meeting is scheduled for Chicago some time in May, 1955. Membership has now reached an all-time high of 410 actives and associates, it was revealed at San Francisco.

Newly elected officers

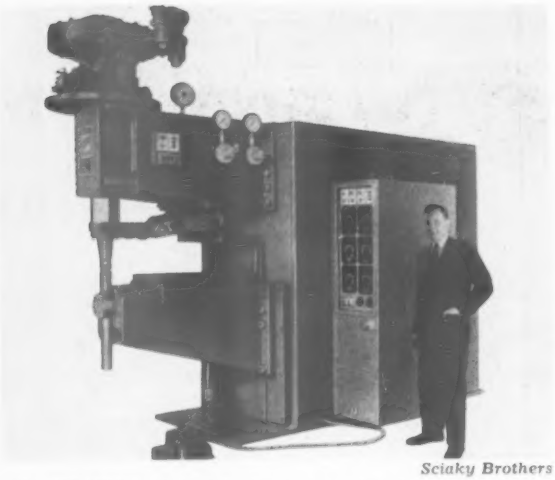
PRESIDENT: J. N. Alcock, Saginaw Welding Supply Co., Saginaw, Mich.

VICE-PRESIDENTS: Robert G. Jackson, Jackson Welding Supply Co., Inc., Rochester, N. Y.; W. P. McLendon, Keenan Welding Supplies Co., Albany, Ga.; E. C. Caluwaert, O. K. I. Welding Supply Co., Cincinnati; C. O. Stilwell, Gulf Welding Equipment Co., New Orleans; C. S. Rutherford, R & R Welding Supply Co., Des Moines, Ia.; Gordon Duff, Gordon Duff, Inc., Los Angeles.

DIRECTORS: Carl W. Berner, Welders Supply, Philadelphia; Hanson C. Hall, Sr., Dixie Gases, Inc., Atlanta; R. J. Koltes, Red Arrow Sales Corp., Madison, Wis.; Lewis G. Moore, Moore's Welding Supplies, Maryville, Mo. (all terms expiring in 1957). Howard R. Proctor, Acme Welding Supply Co., Houston, Texas (term expiring in 1955). W. G. Lufgren, United States Welding Works, Inc., Denver, Colo. (term expiring in 1956).

American Electric Fusion Corp.

1—TUBE mills with resistance welders incorporated have been one of the many developments of recent years



Sciaky Brothers

2—HEAVY-duty aluminum spot welder shows huge size of some of today's equipment for resistance welding

77 years of resistance

Biggest forward step was the electronic control. This development made possible the increased production that helped us to win the second world war.

BY PRESTON M. HALL

IN TWO previous articles we have watched the resistance-welding industry grow from a baby (the first patent for a butt welder in 1885) through early childhood. And we saw that there was always something holding resistance welding back and preventing it from reaching its full potentiality. This something was a lack of reliability or, if you prefer to word it otherwise, a lack of consistency in weld quality.

Without doubt, the most important forward step ever taken was the development of accurate timing devices. Next in importance, perhaps, was the design of machines incorporating features that allowed an accurate control of pressure. It can be seen how essential both developments were when it is realized that current, time and pressure are the three important variables that control weld quality. Furthermore, no one of these variables is independent of the other two. Both current and pressure must be timed.

Operator Was the Judge

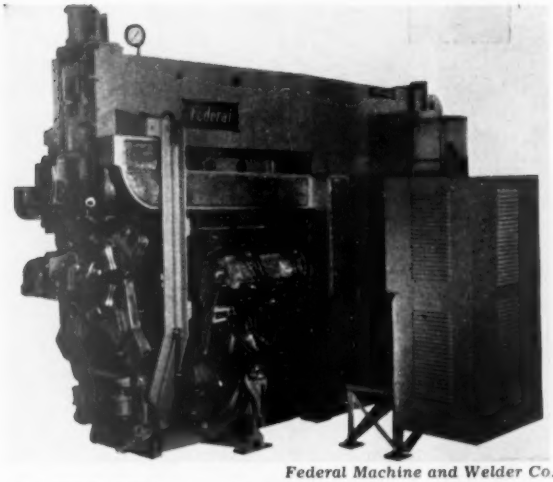
The earliest machines for resistance welding were able to regulate the amount of current, but they left the duration of the weld solely to the operator's judgment. Sometimes he made a good weld, more often a bad one. On mild steel, he might not do too badly, but some metals such as aluminum were impossible to resistance weld at all. It was obvious to everyone in the industry that something had to be done to time the duration of current flow.

The first electric control apparatus was made about 1924. It was not until the electronic age was further advanced, however, that the wedding of resistance welders and electronic tubes was achieved. The secret of a workable electronic control was found in the combination of ignitron tubes to make and break the heavy currents plus thyratron tubes and relays to regulate the firing points of the ignitrons. It quickly became possible not only to time weld duration but to introduce repeat cycles of: (1) squeeze time, (2) weld intervals including *(a)* heat and *(b)* cool times, (3) hold time and (4) off time, each of these periods being regulated in units of 1/60 second.

By the early 1940's, both synchronous and non-synchronous timers had been developed. A non-synchronous control permits random closing of the power circuit by pushbutton, mechanical timer or foot switch. Such random operation results in momentarily abnormal current peaks that may introduce undesirable variations in weld quality, especially in welds of only a few cycles. A synchronous control closes and opens the power circuit at the same point on the voltage wave for every weld. This eliminates the high transients and permits more consistent welding.

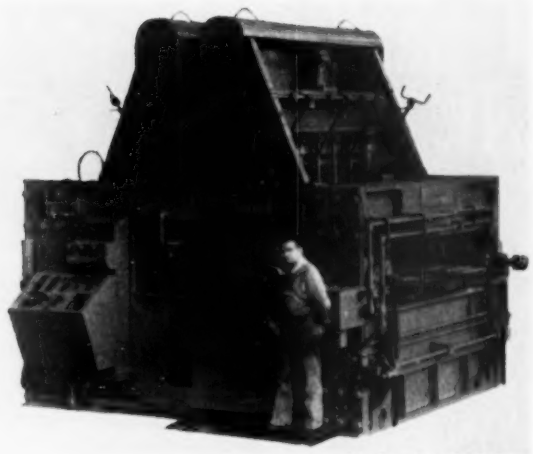
Since World War II, the simple sine wave of the ordinary 60-cycle current has been altered greatly. Today the shapes of current waves seem almost fantastic. Electronic engineers have introduced such present-day refinements as low-frequency conversion and slope control. "Up" slope control causes the current to rise gradually in order to give a slow preheat prior to the weld. "Down" slope control similarly causes a gradual current decline after the weld, which prevents the cracking that a too sudden cooling might cause in certain alloys.

It is no exaggeration to say that the electronic control has made possible the growth and development of the modern resistance-welding industry. Before electronic control, you never knew what sort of weld you were going to get. Electronic control was the



Federal Machine and Welder Co.

3—THIS 500-kva machine has only one job: to form and seam weld metal barrels at high production speeds



Taylor-Winfield Corp.

4—LARGE flash welder for strip mills is a direct descendant of early butt welder pictured last month

welding—III

first successful start toward licking that problem. It has since been supplemented by other measures. Today leading users of resistance-welding equipment, particularly in the aircraft industry, are following elaborate statistical methods of quality control to insure that almost every weld will be up to the required specifications.

Copper-Base Electrodes

Another major development was the discovery (made about 1922) that certain copper-base alloys could be substituted for copper electrodes. Pure copper is used now only where the highest conductivity (100%) is essential. For most spot-welding electrodes, seam-welder wheels and flash-welding dies, the copper base is alloyed with such other elements as cadmium, chromium, cobalt, beryllium, tungsten and molybdenum. Today we have more than half a dozen of these alloys, the conductivity of which ranges from 80% (copper 99%—cadmium 1%) down to 28%. It is no exaggeration to state that, on the average, electrodes made of these alloys last eight times longer than pure copper and insure much more uniform welds.

Electrodes of the highest conductivity are used for the spot and seam welding of aluminum and magnesium. Then come electrodes for steels and nickel alloys, electrodes for stainless steel and finally dies for flash-welding and projection welding, for which strength and hardness are of greater importance than conductivity.

Balancing the Load

Still another very important factor in the industrial importance of this process was the introduction of machines which drew a balanced load from the power supply lines. Starting about 1939, several types of these machines were developed; namely, stored-energy (electrostatic and electromagnetic) and three-phase welders. All of these were essentially designed for cases where the welder load was too great for the available power supply. Which method is best is still a highly controversial question among the leading welding engineers in the country, although of late the stored-energy methods seem to have fallen into disfavor.

In 1936, the industry received a much needed organizational uplift through formation of Resistance Welder Manufacturers' Association.

Other developments leading to the rapid recent growth in the acceptance of resistance welding can only be mentioned. Some of them are:

The tube mill for producing seam-welded tubing (photo 1).

Heavy-duty aluminum welders (photo 2).

Multiple spot welders.

Pulsation welding. Here the weld interval is divided into alternate "heat" and "cool" times. The "cool" times interrupt the welding current between "heat" times.

Large mat and grating welders.

High-production can and barrel welders (photo 3).

Large flash welders for strip mills (photo 4).

Air-operated rocker arm machines.

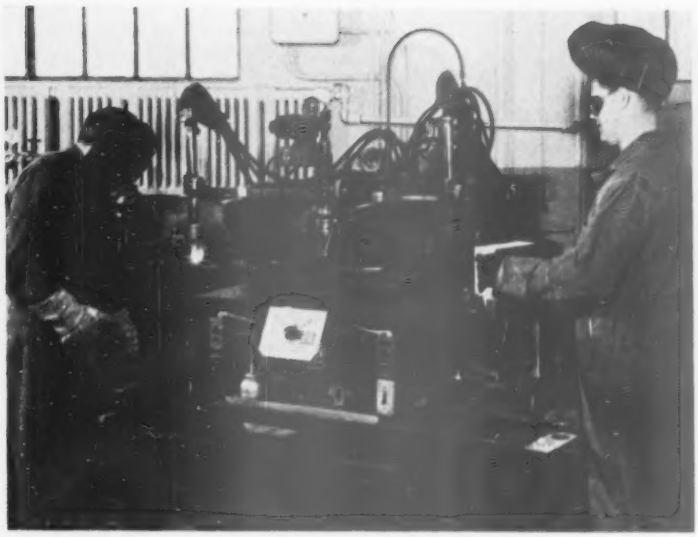
Special purpose press-type welders.

Low-inertia spot-welding electrode holders.

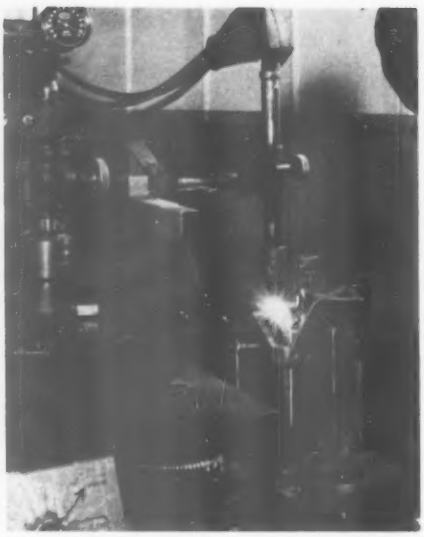
Miniature welders. Some of these have electrodes no bigger than darning needles and are used for joining the delicate components of electronic tubes.

The resistance-welding industry had made most of its forward strides in technique and machine design before the start of World War II. Thus it was able to do an outstanding job of meeting the high-production wartime demands for airplanes, guns, tanks, transportation equipment, shell cases, droppable gasoline tanks, etc.

For a few years after the end of hostilities, the rate of expansion and production was somewhat slower. The curve then began to turn upward. Even if it tends to turn down again, however, a short "breathing spell" can do no real harm. Like an adolescent child, the industry has perhaps grown a little too rapidly for its future well being. But time will take care of that.



1—ONE fixture is being loaded, while the other box is being Tig welded. A shape-cutting machine was adapted to do this type of work



2—COMPLETING a rectangular weld at one end of larger size aluminum box

Two arcs and helium speed job

Use of thoriated-tungsten electrodes also contributed to faster production welding on boxes of aluminum that were needed by the U. S. Army for portable radios.

THREE factors have contributed greatly to the production speed of welding aluminum case boxes (two sizes) at the Gray Mfg. Co., Hartford, Conn. They are: (1) the shielding gas used, (2) the adaptation of tungsten inert-gas equipment for a two-torch operation and (3) the use of thoriated-tungsten electrodes.

Selection of the shielding gas can be of extreme importance in getting maximum production speeds as well as additional efficiencies in terms of weld quality. The choice is not limited to either helium or argon but may embrace various mixtures of both in different proportions. In selecting a shielding gas, job factors such as the nature of the operation (manual, machine or fully automatic), material used, thickness to be welded, desired weld quality and contour, joint design, etc., must be carefully considered.

Faster with Helium

Current practice for the production welding of thin sections of aluminum by fully automatic installations indicates that helium when used with direct current will more than triple the welding speed obtainable with argon and alternating current. The Gray Mfg. Co., for instance, is getting 30-32 ipm with helium, d-c, on 0.064-in. thick and 0.090-in. thick 52S aluminum. With argon and a-c, the speed was 9-10 ipm. Helium speeds, it is said, have under certain conditions run as high as 240 ipm. For manual operations on the same thicknesses of material, however, argon is the better gas.

The reason for the increased speed is twofold: helium produces a hotter arc, and machine or fully automatic operations permit better control of adjustment factors than do manual operations. These factors include the desired constant distance between the electrode and the workpiece, uniformity of movement along the seam, etc. With machine operation, the hotter arc obtained with helium can be controlled and moved rapidly along the work. Slower manual operations on the same thicknesses of material require the softer arc produced by argon.

3—SMOOTH welds on the larger box are revealed by this picture

Two-Arc Operation

The second major contribution toward increased production speed on the Gray Mfg. Co. project was the adaptation of a pantograph-type flame-cutting machine to hold two inert-gas welding nozzles. This makes it possible to load one fixture, adapted for one size box, while the other is in action on a different size (photo 1).

The first box is of 0.064-in. aluminum with an 0.064-in. lid of 52S aluminum. It requires a 12-in. longitudinal seam and a continuous rectangular weld of 3½ by 6½ in. The rectangular weld is made continuously even though four changes in

A WELDOR'S WOES

WHEN YOU GET YOUR CUTTING MACHINE SET UP AND WORKING NICELY..
THEN
THAT'S THE TIME FOR SOME LEAD-FOOTED CHARACTER TO STUMBLE OVER YOUR HOSE.
WHY DOES SOMEBODY HAVE TO STRIKE AN ARC ON THE C-CLAMP THREADS?
LIMBER HOSE IS NICE BUT EVERYBODY THAT WALKS BY, SHUTS OFF YOUR TORCH
TACK SOMETHING TEMPORARILY AND IT LOOKS FINE-
-BUT ON THAT SPECIAL JOB IS WHERE YOU RUN INTO ARC BLOW, WET ROD, AND OTHER JINXES
FRANK TABOR
AIR OUT YOUR GRIPES ON THIS PAGE, WELDORS. IF YOU CHOKE UP WHILE WRITING TO US, PLEASE USE THIS CRYING TOWEL.
GET SET TO WELD AND YOU GOTTA SHAKE HARD TO GET YOUR HOOD DOWN
BUT
JUST TRY TO MEASURE SOMETHING WITH IT UP!

direction must be made around 90-deg corners. Helium is consumed at the rate of 50 cfh. Straight polarity d-c is used, and the current range is from 72 to 80 amperes.

The steel templates for the magnetic tracer are bolted to a modified table. This table, about half the standard size, was built by the company from stock materials. The cutting-torch holders were adapted to fit the tracer bar, which was extended so it could operate from either side of the machine. Operation of the tracer and amperages for machine settings are controlled in front. Duplicate sets of starting switches for shielding gas and the 200-amp welding generator are provided on each side.

The second box is of 0.064 in. aluminum with an 0.090-in. lid. It requires an 8-in. longitudinal seam and a 3¼ by 7¾ in. rectangular seam. Again, helium, d-c, is used at rate of 50 cfh. Current range, however, is 80-85 amperes. On both boxes, the joint design provided all the metal necessary for the welds. The edges were simply fused together without additional filler.

Photo 2 shows the machine holder with a 3/32-in. thoriated tungsten electrode completing the rectangular weld on the second size of box. Toward the left, you can see how the 1-in. diameter roller of the magnetic tracer is guided by the template.

Thoriated Tungsten

The third factor contributing to the fast production is the use of thoriated tungsten electrodes instead of standard tungsten. Thoriated tungsten makes available higher currents, and there is less risk of contaminating the electrode if it accidentally touches the molten metal. The electrode cleans itself without disturbing the arc. The presence of thorium oxide on the surface of the cathode (electrode) causes it to emit about 90 times as many electrons per unit surface area as a pure tungsten electrode.

Eighty boxes of each size are being produced each day by this installation at the present writing. The smooth welding on the rectangular and longitudinal seams of one of the larger size boxes may be seen in photo 3. The boxes are for radio transmitting and receiving units for the U. S. Army.

Photos courtesy of Air Reduction Sales Co.

HEAVY CASTING REPAIR

(Continued from page 60)

tion of alignment. The two views of a welded box frame (photo 6) illustrate the somewhat complex alignment problems that are frequently encountered. The general plan is to bring the parts snugly and firmly together with a turnbuckle, gouge out a groove about two-thirds the depth of the section, weld this side solidly, groove out the other side and weld. With this procedure, the parts are never allowed to get out of alignment. Incidentally, the casting shown here was back in service 48 hours after the break occurred.

In photo 7 steel bars and long bolts make a simple yet effective clamp for aligning a casting that weighs several tons. The cross-section of the fracture measured 14 in. by 16 in.

Dentists for Gear Teeth

Dental work on cast-iron gears makes use of similar procedures—preheating, then a welded build-up of the teeth with cast-iron filler rods. Since gear teeth are often subjected to severe shock loads, it is important to leave no hardened areas that can set up notch effects. The rim is preheated (at various points determined by the locations of the broken teeth) to prevent the development of strains or hard spots, and the wheel is kept well covered. This retains the heat and also protects the hot metal from drafts. If a welded tooth is to be machined, the gap between two sound teeth may be filled. Very often each tooth is built up individually and made slightly oversize so that it can be ground to the proper dimensions.

The gear wheel shown in photo 5 is 6 ft in diameter. It was shipped to Storts from a metal-warking plant 150 miles away. This big gear drives a heavy blanking press. Seven broken teeth, which had earlier been built up by another process, had all broken off again when the press went to work. The teeth were rebuilt by the procedures described here. A check-up made six months after the repair disclosed that the gear was operating with complete satisfaction.

Oxyacetylene welding also furnishes first aid to many foundries in this area. Casting defects do happen. Sometimes it is a deficiency in design, sometimes a fault in foundry practice, sometimes . . . well, just one of those things.

The group of castings for machine bases in photo 8 came through with cracks in the web members. Otherwise, the castings were in good condition, and they were urgently needed in production. A preheating, welding and cooling procedure was worked out, and the bases were salvaged at relatively low cost. Foundries have had no difficulty in satisfying their customers concerning such repairs. It is only necessary to point out that cast iron is fused with cast iron, resulting in a homogeneous structure.

THREE-IN-ONE UNITS

(Continued from page 49)

The first automatic operation (shown in photo 3) is to build up the top ring groove. Welding conditions are: 360 amp, d-c, reverse polarity; 3/32-in. aluminum rod; an argon flow of 20 cfh. The piston revolves once in 3 minutes, 25 seconds, a peripheral welding speed of 11½ ipm. Three or four overlapping passes are made on one groove. At this speed, a groove is rebuilt in about 14 minutes.

The versatility of the C. & N. W. set-up is seen in photo 4, where the same equipment is being used to rebuild the crown. The piston is on a circular plate riding on roller bearings. The edge of this plate has a gasket, which is forced against the vertical plate at left of the piston. The vertical plate, clamped in place of a chuck, turns the plate holding the piston. Preheat gases are brought up into the piston interior by a pipe from underneath the lathe.

The same process of Mig welding is used on the piston crown. At each complete revolution, the welding gun is racked in (or out) to make a spiral overlapping aluminum-deposit.

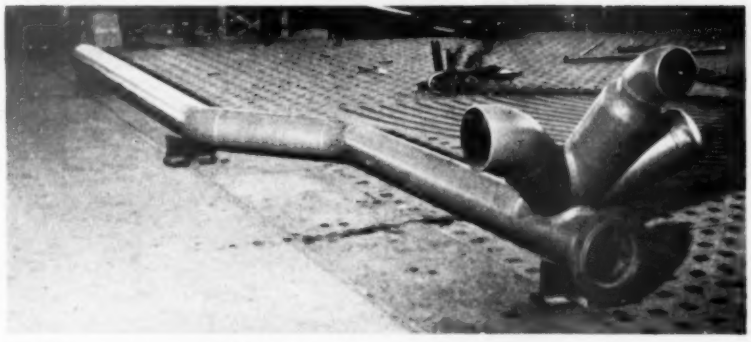
Manual Welding, Too

Cracks in pistons are repaired manually with the same equipment. The welding gun is lifted from the holder on the lathe and used manually as shown in photo 5.

Inexpensive but efficient, this set-up is being used to reclaim hundreds of pistons. The reclamation cost is about $15 per piston, representing a significant saving to the railroad.

Photos courtesy of The Linde Air Products Co.

on the job . . .



Tricky pipe welding on a roof drain assembly

THE welded piping assembly pictured above was fabricated at the Birmingham, Ala., shop of the Crane Co. for the roof drain of a new power plant. The main downcomer is 8-in. pipe, while the welded nozzle inlets are 8-in. and 6-in. sizes. Overall length of the assembly is about 20 ft 6 in.; weight is 890 lb.

Using welded construction to its fullest extent, the designer has combined the multiple openings into a compact arrangement with far less weight and bulk than would have been possible with other joining.

A casual glance at this assembly could be deceptive. The angular nozzle welding of three inlets is not as simple as the streamlined appearance might suggest. This type of fabrication involves tricky cutting, set-up, alignments and welding techniques.

* * *

Washer motor, welded frame . . . make a lawn mower

By A. M. Wettach

HAROLD Gardner, rural dweller in Lee County, Iowa, had an old washing machine gasoline engine around and decided to make a power lawn mower. He arranged the engine on a platform to drive a whirling straight blade by means of a twisted V-belt and also to drive the rear wheels. A circular iron guard was fastened to the mower platform, and a steel bar was welded to the rear axle as a guard. Long handles of shaped iron pipe gave the operator plenty of leverage. The front wheels were set out on arms to make it easier to mow on uneven ground.

Courtesy Oxweld Railroad Service

Aids car clean-up

CAR repair men of the New York Central Railroad recently took stock of 150 streamlined passenger cars that had been in service for several years. They decided that the stainless-steel exteriors of these cars should be cleaned up. It was necessary to strip off the cars' fluted sidings. This was done at the railroad's Beech Grove, Ind., shops. After the strips had been removed, those deemed reclaimable were cleaned thoroughly on both sides by means of a specially built machine, which propelled the strips at high speed between two wire brushes. The strips were then put back on the cars by inert-gas spot welding.

The 70-ft-long pieces were placed on a cambered table and assembled. Seven strips are required for the lower section of the car, four strips for the section above the windows. Using an inert-gas welding gun with a 1/8-in. tungsten electrode, an operator started spot welding at one end to hold the pieces together. Next a few spot welds were made in the middle of the section and then some at the other end. Finally, the remainder of the spot welds were made in between. A bottom section of a car siding required 1,550 spot welds, a top section 890.

New 1/16-in. stainless-steel channels were arc welded to the sides of the car, and the assembled sections of sidings were placed in position. One man operated a lever to hold the siding in place while his fellow worker spot welded the stainless-steel sheathing to the channels (picture above). On this operation, a bottom section required 300 spot welds, a top piece 225.

Argon flow was 25 cfh, and about two cylinders of argon were used for every three cars.

Americans Are Rolling Up Their Sleeves!

YES, ALL KINDS OF PEOPLE ARE GIVING BLOOD SO THAT OUR WOUNDED MAY LIVE!

• Today, the blood of a Boston bookkeeper may be flowing through the veins of a wounded kid from a Kansas farm . . . the blood of a pretty Southern housewife may have saved the life of a grizzled leatherneck. For, blood is blood, a God-given miracle for which there is no substitute . . . and when a man's life hangs in the balance and blood is needed, there is nothing else to take its place!

Right now the need for blood is urgent. In hospitals —at home and overseas— many men require four and six transfusions during delicate operations. And the blood *must be there*—when it's needed. So give the most precious gift of all—*your* blood!

Be assured that giving blood is neither difficult nor distressing. And what a thrill there is in knowing that you've performed a really unselfish act! So call your local American Red Cross today and make an appointment. And tell your friends and neighbors about your experience. Let them share the wonderful feeling Americans get when they roll up their sleeves—and give blood.

But—

WHAT HAPPENED TO THAT PINT OF BLOOD YOU WERE GOING TO GIVE?

Call Your American Red Cross Today!

Remember the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS.

Engineered for endurance

THE TUBE-TURN Welding Neck Flange is the preferred choice for most severe piping services—resulting from high pressures, temperature extremes, or numerous fluctuations of substantial amount in either temperature or pressure or both. Due to its long-tapered hub which affords a smooth transition in thickness, the welding neck flange assembly has an endurance strength equal to that of pipe joined by butt welds.

You can fill all your requirements for Welding Fittings and Flanges from TUBE TURNS' complete line. For prompt, efficient service, call your nearby TUBE TURNS' Distributor. You'll find one in every principal city.

The Leading Manufacturer of Welded Fittings and Flanges

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

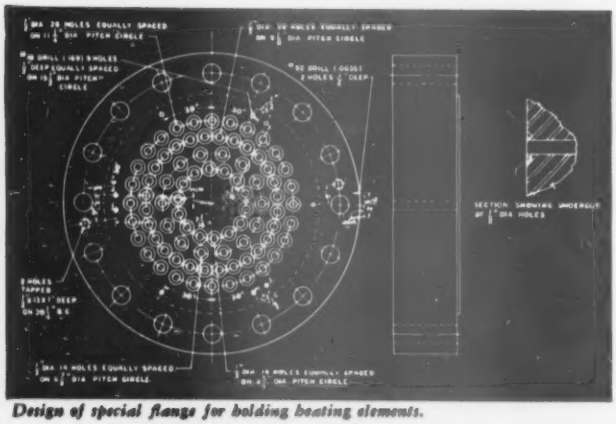
DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Chicago • Denver • Los Angeles
San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

ENGINEERING SERVICE

YOUR NEEDS *in welding fittings and flanges are met efficiently and quickly by your nearby* TUBE TURNS' *Distributor. There are more than 4000 items in the complete line of* TUBE TURNS' *products. Example: carbon steel elbows from ½" to 42" diameter as shown.*

SIMPLIFIES JOB. *The uniform wall thickness and true circularity of* TUBE-TURN *Welding Elbows makes possible accurate fit-up when cut to odd angles for jobs such as the 16" gas line shown.*

Your problems solved by TUBE TURNS' ENGINEERING SERVICE

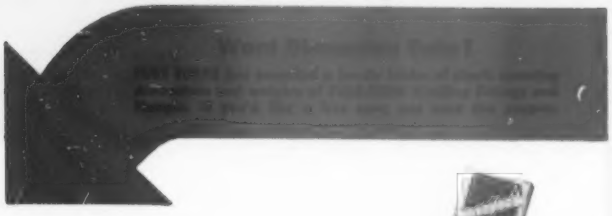


Design of special flange for holding heating elements.

MOST FLANGE NEEDS in industrial piping are filled by TUBE TURNS' ASA line of various types, sizes and materials. However, there are many exceptions . . ."specials" such as these: (1) lens ring flanges for use at 5300 psig and 400°F, with test pressure of 10,600 psig; (2) flanges in sizes from 14" through 72" for use at 30 psig and 400°F max.; (3) 2" flanges for high vacuum service at 400°F—950°F, and (4) various complex sheet tube flanges.

A "special" example is shown at the left, developed by TUBE TURNS' Engineering Service Division for E. L. Wiegand Co., Pittsburgh. It has 84 holes for heating elements. Flanges must withstand hydrogen-nitrogen mixture at 1000 psig at 750°F and 3000 psig at atmospheric temperature.

TUBE TURNS IS AT YOUR SERVICE!



TUBE TURNS, Dept. N-2
224 East Broadway, Louisville 1, Kentucky

Company name _____

Company address _____

City _____ *Zone* ____ *State* _____

Your Name _____

Position _____

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New York	Midland
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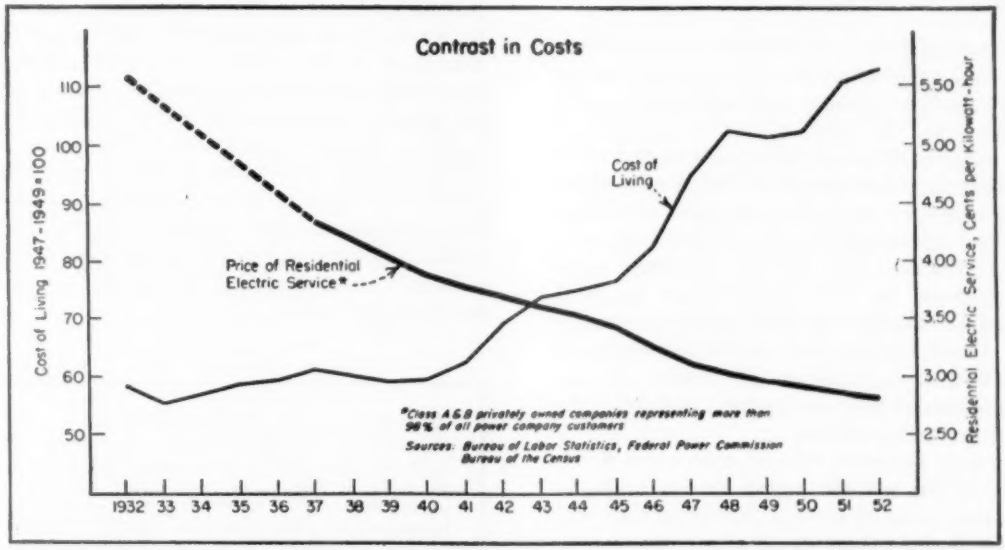
"tt" and "TUBE-TURN" Reg. U.S. Pat. Off.

TUBE TURNS
LOUISVILLE 1, KENTUCKY
A DIVISION OF NATIONAL CYLINDER GAS COMPANY

A 20-YEAR RECORD...

The Electric Power Companies' Case for Public Confidence

An economic study of the record of the investor-owned electric power companies of the United States over the past twenty years underwrites their claim to public confidence today. A key factor of this record is set forth by the chart in the middle of this page. This shows that while the cost of living as a whole has almost doubled, the average price of electric energy for residential use in the United States has been cut in half.



The average prices of industrial and commercial power also are much lower than they were twenty years ago.

Such a study confirms the record on other key accomplishments of the electric power companies during the past two decades.

They have not failed, either in peace or war, to meet the nation's rapidly expanding electric power requirements. In paying tribute to the performance of these companies during World War II, J. A. Krug, Director of the Office of War Utilities, said, "Power has never been too little or too late." The same can be said for the entire period of the past twenty years.

To be ready with enough power – on time – the electric power companies have expanded their production fourfold since 1933. This has required an investment of over $17 billion in new facilities. To raise the funds for this investment they have enlisted the participation of about 3 million direct stockholders. Through life insurance companies, banks and similar institutions, about 90 million Americans – more than half of the nation's total population – have become investors in electric power companies. By thus relying on private investment for their expansion, the power companies have provided their

plant and operating equipment without burden on the taxpayer.

In addition, the investor-owned companies have paid about $12 billion in taxes to various governments – national, state and local – over the past twenty years. Unlike government-owned and -operated systems, they have received no public subsidies. When taxes and subsidies are taken into account, the rates for electricity charged by the investor-owned companies have been as low as, or lower than, those charged by government-owned and -operated systems.

Many Americans do not appreciate the job that the power companies have done over the past two decades. That is due, in part, to the public memory of financial abuses by some utility holding companies during the 1920's. This memory obscures a clear and unprejudiced view of the progress since those days. And some of the all-out advocates of reliance on government rather than on regulated private enterprise for the development of our power resources do their best to keep this memory of the past alive in the present.

An Impressive Case

Some special cases of electric power development may involve problems for which the investor-owned companies are unable to provide full solutions. This may be true, for example, of some large multiple-purpose projects that combine electric power generation with related developments such as the improvement of navigation, flood control and the irrigation of arid lands. Some of the economic and administrative problems imposed by such projects are not well adapted to effective handling by private enterprise. Flood control and the improvement of navigation, for example, usually involve the provision of much costly service over and above the cost of producing power.

It is true, however, that in some cases development of the electric power side of multiple-purpose projects by private enterprise may well be more feasible than would appear from statements by some government power advocates. And the record indicates that even in those projects on which both the power generation and the other services are handled by public authority, it may well be desirable to have the investor-owned companies assume the transmission and distribution functions.

Our study of the record of the investor-owned and -operated companies over the past twenty years has led us, of course, behind the statistics that bear on the wisdom of giving them a priority in the development of our power resources. It reveals that these enterprises are manned by people who, through lifetime experience, are peculiarly conversant with the needs of the communities they serve. They have given the consumer notably good service while conforming to standards set and enforced by public regulatory commissions. They have won the confidence of the investing public. By their nature and their experience they are competent to handle any power program that can be demonstrated to be economically sound.

The Paramount Public Interest

By their economic performance during the last twenty years, the electric power companies have earned the confidence of the public. By relying on these companies to meet its electric power requirements the public will fully protect its economic interest in ample and efficient service at fair prices.

That is where our study comes out. Our findings do not touch the political consideration that private operation of electric utilities under public regulation is a safeguard against further concentration of both political and economic power in a federal government that already commands too great a concentration. But if these findings make an economic case for preferring power development by tax-paying business as against power development by governmental agencies, they clear the way for an appeal to the paramount public interest in safeguarding our personal and political freedoms against the further encroachment of government.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

Area of a curved surface

By W. F. SCHAPHORST

WELDORS are very often compelled to work with cylindrical objects. For instance:

Pipes and tubes are hollow cylinders.

Tanks and pressure vessels are, quite frequently, much larger hollow cylinders.

Shafts are solid cylinders.

Often it becomes necessary to know the area of a cylindrical surface for such purposes as ordering plate material, figuring the amount of metal that will be needed for build-up of shafts, estimating the amounts of insulation and paint required to protect the surface of a tank, etc.

Here is a chart that will prove handy for quickly determining the area of any cylindrically curved surface.

As an example of how it is used, let us take the exaggerated case of a huge pipe 20 in. in diameter and 191 ft long. How many square feet of curved surface?

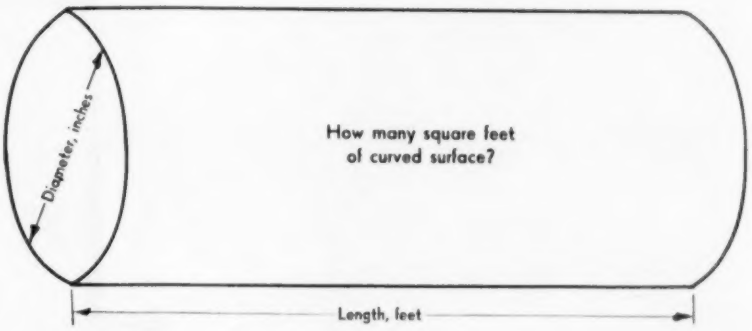
Simply connect the 20 in column A with the 191 in column C, as shown by the dotted line. You will find the answer, given by the intersection of the dotted line with column B, to be 1,000 square feet.

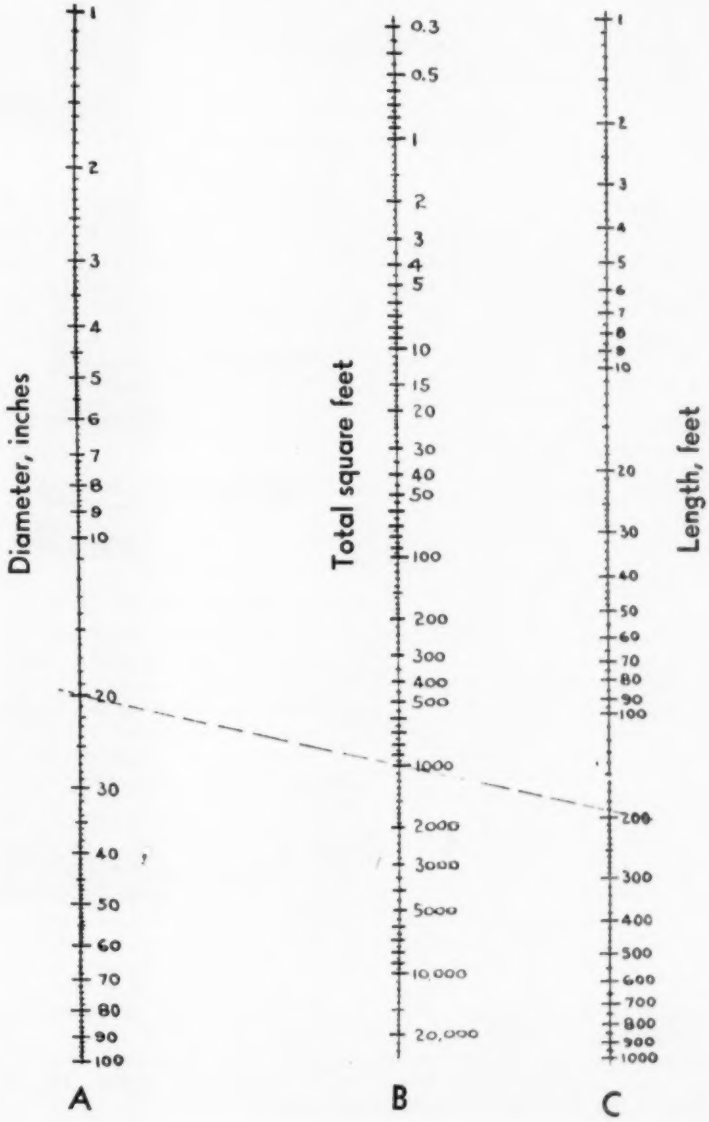
You can easily verify that this is correct by using the formula:

$A = 3.1416\ dl$, where d equals the diameter and l the length of the cylinder. Be sure you remember, however, before you start to multiply that d and l must be converted into the same units, either both in feet or both in inches.

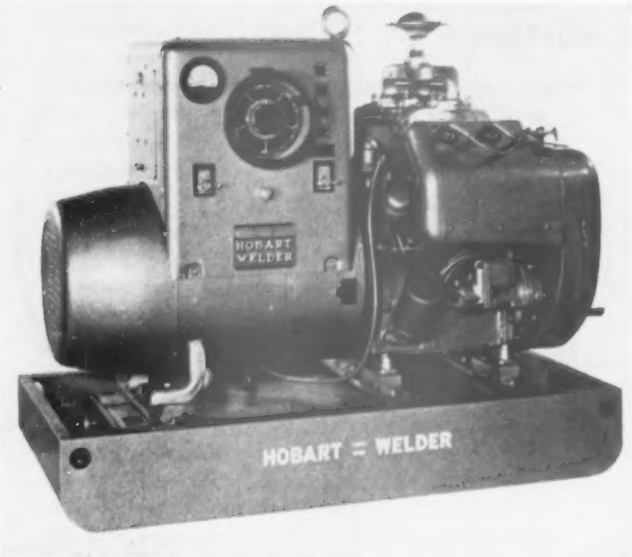
If you wish to know the total surface of the cylinder, including the two circular ends, add to the curved side area the area given by the formula: $1.5708\ d^2$. This allows for both ends. If only one end is to be figured in, as in the case of a cylinder open at the top, the amount to be added on is given by: $0.7854\ d^2$. You will have to figure these end areas out the hard way as they are not included in the chart.

As will be noted, the range of the chart is very wide—from 1 to 100 inches in diameter and from 1 to 1,000 ft in length.





New Products . . .



DUAL-purpose unit serves as field arc welder and power plant

EASY current adjustments are featured here

Field Welder

COMBINATION a-c arc welder and a-c power plant has been developed with an eye to the needs of farmers, builders, contractors and others who depend upon electric power for many purposes. A selector panel in conjunction with a standard control panel is said to make this machine very versatile. By removing only two wing nuts, the selector panel can be moved to any of three locations to provide 60 to 80 volts for welding, 110-volt power or 220-volt power.

Welding current can be adjusted by means of a large handwheel on the control panel, which operates the main-range switch of heavy copper molded in bakelite. The volt-ampere adjuster is also on the panel.

In addition to being a full-capacity, 200-amp, a-c arc welder, this dual-purpose machine will supply power to operate lamps, electric grinders and other electrical equipment.

HOBART BROTHERS Co., Hobart Square, Troy, Ohio.

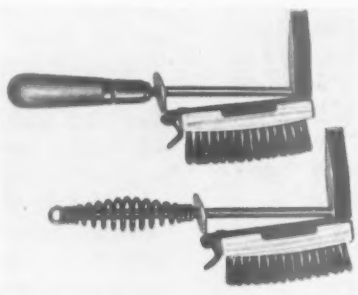
* * *

Glove Chart

NEWLY designed industrial glove selector shows at a glance the correct glove for every need. It rates the gloves according to their resistance to various kinds of destructive elements. The information is said to be based on laboratory tests—pressure needle and immersion—and extensive user experience. The chart measures 8½ by 3 in.

SURETY RUBBER Co., Carrollton, Ohio.

* * *



Weld Brush-Chisel

NEW design of these double-purpose weld-cleaning tools is said to make them more durable and easier to use. The brush is now pitched at an angle to the handle, making it easier to apply the whole surface of the brush without scraping the knuckles along the work.

The frame holding the brush and handle is of heavier-gage steel and is ribbed for additional rigidity. The chisel is now welded to the frame; it had been riveted. A double-tension spring secures the brush in the frame. The brush can be replaced or reversed simply by pulling back the spring. The new tools are also equipped with a handguard.

ATLAS WELDING ACCESSORIES Co., 707 E. Lewiston, Ferndale (Detroit 20), Mich.

Rectifier Welder

THE "G-E Type WR40A" is a new 400-amp, three-phase, d-c, selenium-rectifier-type welder with a 60% duty cycle. It can be equipped to operate on a two-phase power and has a welding current range of 70 to 500 amp.

A stepless current control makes it easy to achieve current adjustments. The welder can be used with a variety of electrode sizes. Another feature is quiet operation, and maintenance is simplified because the sides are easily removed. Instant arc welding is said to be assured because there is no inductive time lag.

The unit is operable on 220/440 volts, reconnectable to either voltage. It is 35 in. wide, 26 in. deep, 47 in. high and weighs 660 lb.

GENERAL ELECTRIC Co., Welding Department, York, Pa.

* * *

Hardness Tester

PORTABLE bench-type hardness tester for small or highly finished parts combines a positive-controlled, diamond-penetrating action with a high-power microscope (400X). Furnished with the instrument are instructions and tables that convert readings into Rockwell and other standard hardness scales.

In addition, coarse impressions, such as the Brinnell ball test, may be measured.

GEORGE SCHERR Co., INC., 200 Lafayette St., New York City 12.

Here's LOW-COST WEAR PROTECTION at its BEST!

COATED TUBE STOODITE

Your Stoody dealer (listed in the "Yellow Pages" of your phone book) is ready to supply you. Literature is available.

STOODY COMPANY

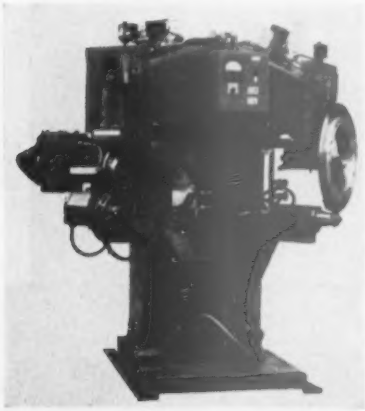
Face-Shield Binding

FACE shields with the clear cellulose acetate windows are now available with new aluminum metal binding as well as plastic tape. The new edging does away with sharp acetate edges, and the windows can be bent into any shape desired and will better hold this shape.

There is no change in attaching the new windows to the headgear; the aluminum metal-band window will fit all of the firm's face-shield headgears. The plastic tape and aluminum-edge windows are optional and interchangeable.

SELLSTROM MFG. CO., 626 N. Aberdeen St., Chicago 22.

* * *



Dual-Head Seam Welder

COMPLETE set-ups for either longitudinal or circular seam welding are maintained by this new dual-head resistance welder. Mounting two heads at 90 deg, the unit can be converted from circumferential to straight-line work by the flick of a switch.

The welder is available in a size range from 30 kva to 150 kva and operates on 440 or 220 volts, 60-cycle, single-phase power. Either head operates from a single transformer, but both have individual drives with variable-speed control as well as separate heat controls.

UNIVERSAL WELDER CORP., 2557 E. 79th St., Cleveland 4.

* * *

Lightweight Goggles

AVAILABLE with clear or green curved lenses, these new "Welsh-guard" safety goggles are said to be ideal for semi-hazardous operations. The frame is acetate and has full-vision, spatula-type temples. The non-replaceable lenses are said to have excellent optical qualities.

WELSH MFG. CO., 9 Magnolia St., Providence, R. I.

Dual-Spot Welder

TWO "BH" spot-welding heads and associated timing units are main components of this duplex bench for assembly welding. These units are intended for small assembly work.

The heads are suitable for a wide range of welding voltages and power ratings. Transformer selection depends upon the class of work to be welded and the timing unit to be employed. Standard transformer supply is 240 volts, 1 phase, 50 cycles.

HIRST ELECTRONIC DEVELOPMENT LTD., Dermody Rd., Lewisham, London, S. E. 13, England.

* * *

Welding Goggle

LARGE openings for ventilation that are shielded by the "Stac-Vent" hood give the wearer of these new "Model 492 SV" goggles greater comfort. "Stac-Vent" welding goggles provide draft ventilation at the top and center where warm, moist air normally accumulates.

The opaque, vinyl plastic frame, large enough to fit over all prescription glasses, fits the contour of the face and nose, leaving no gaps. Lens holder has pockets for replaceable 50-mm round lenses that are protected on both sides by hard plastic cover lenses.

WATCHEMOKET OPTICAL CO., 232 W. Exchange St., Providence, R. I.

Silver-Brazing Flux

SILVER-BRAZING flux is compounded specifically for work on stainless steel, nickel, Monel, copper, beryllium-copper, brass, bronze, steel and silver metals. Known as "All-State No. 110 Brazaloy Silver Brazing Flux," it is mixed with plain water and brushed on the work.

Manufacturer states it affords complete protection to the heated base metal up to 1,800 F and at the same time dissolves the oxides that must be carried away before a good joint can be made. This homogenized uniform-action flux is available in ½ and 1-lb jars and in 30 and 65-lb drums.

ALL-STATE WELDING ALLOYS CO., INC., 249-55 Ferris Ave., White Plains, N. Y.

* * *

Safety Glasses

"TWIN-SPEC" glasses have a frame with temples plus a twin front that easily snaps on or off the frame. The wearer's prescription lenses are used in the frame itself, and protective lenses are used in the twin front.

ZYLO WARE CORP., 11-15 47th Ave., Long Island City 1, N. Y.

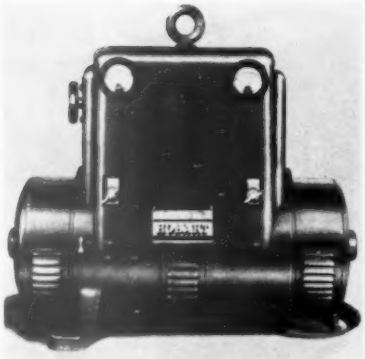
* * *

Soldering Tool

RECOMMENDED wherever light, instantaneous soldering is called for is the "Solder-Quik." Operated on a regular 110-volt, a-c line through a step-down transformer, the tool is said to be a safe, fast-working addition to shop or assembly line.

Operating voltage at the tip is only 3½ to 12½ volts, and no heat is generated except when in contact with the work.

STARK MFG. CO., P. O. Box 489, Tuscaloosa, Ala.



Constant-Voltage Welder

DESIGNED especially for welding with the inert-gas-shielded-arc, submerged arc and other automatic processes is this new constant-voltage, d-c arc welder. A hand wheel, located conveniently on the side of the control cabinet, permits setting the machine for the desired arc voltage, which remains constant regardless of the amount of current being used. Results obtained with this equipment are said to be excellent on any desired setting from 20 to 40 volts.

Available in three rated capacities of 400, 600 and 900 amp for operation on electric power supply of two or three-phase, 60 cycles, 220/440 voltage (dual) or for 550 volts (single). For nominal extra cost, the welder can be supplied for 50 or 25 cycles as well as for d-c current supply of 115, 230 or 550 volts.

HOBART BROTHERS CO., Hobart Square, Troy, Ohio.

* * *

Flame-Cutter

"FLAME-O-GRAPH" is the name of a new portable flame-cutting tool that is said to be accurate and rugged. It is capable of cutting a wide range of shapes and sizes, which may be produced from templates that are easily and quickly changed.

Flexibility and simplicity of operation allows one man to handle the production output of two or three "Flame-O-Graphs," according to the manufacturer. Economy is another advantage claimed for this new tool —it is said to cost far less than other devices for mechanical guidance of torches.

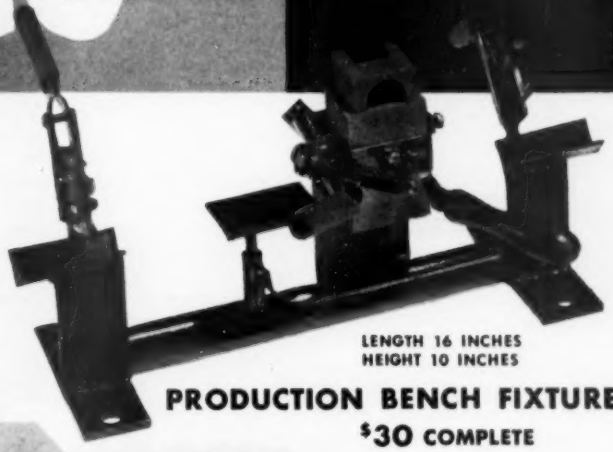
The "Flame-O-Graph" comes equipped with torch and one tip.

VICTOR EQUIPMENT CO., Welding Equipment Division, 844-54 Folsom St., San Francisco 7.

* * *

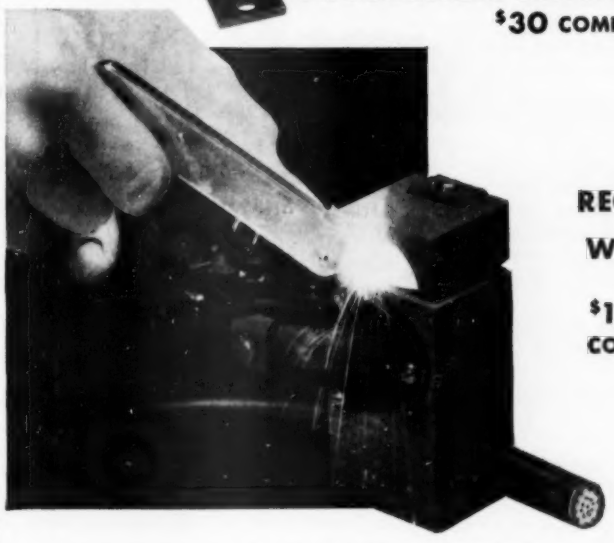
A MOMENT'S *insight is sometimes worth a life's experience.*
—Ralph Waldo Emerson

A CABLE SPLICED IN 10 seconds WITH CADWELD®



LENGTH 16 INCHES
HEIGHT 10 INCHES

PRODUCTION BENCH FIXTURE
$30 COMPLETE



REGULAR WELDER
$15.00 COMPLETE

Either unit used to CADWELD
all CADDY arc welding accessories to the arc welding cable

Send today for your FREE
"CADDY" ARC WELDING
ACCESSORY CATALOG
ELECTRODE HOLDERS, GROUND CLAMPS,
QUICK CONNECTORS, LUGS & CABLE SPLICING

CADDY®
ARC WELDING ACCESSORY DIV.

ERICO PRODUCTS, Inc.
2070 E. 61st PLACE
CLEVELAND 3, OHIO

Rectifier Welder

DUAL-CURRENT rectifier welder is designed to give an output of 40 to 240 amp, a-c, or 10 to 80 amp, d-c. The type of current is selected by means of a changeover switch. When d-c is required, the transformer output is fed to two rectifier valves that are protected from premature loading by a time-delay valve and from excessive current input by a microswitch device operated from the shunt mechanism.

The welder is suitable for connection to a three-phase, 380-480-volt, 50-cycle supply. It can also be supplied for a two-phase 200-220-volt, 50-cycle system. Approximate overall dimensions of the unit are 22½ in. by 24 in. by 34 in. high, and it weighs about 385 lb.

It is suitable for welding light alloys, non-ferrous metals and light-gage sheet.

PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Ave., London, W. C. 2, England.

—McGraw-Hill World News

* * *

Cutting Torch

"MODEL J-5" is a new torch for heavy-duty work. Like all torches made by this firm, it is designed to cut and gouge metals using only an electric arc and compressed air. A solid, one-piece insulated head holds the electrode at a fixed angle, which is said to provide better contact and less heat.

A spring-loaded plunger holds the electrode in place and also acts as an automatic air valve. The air is on as long as the electrode remains in the torch. Two interchangeable heads —one for ⅜-in. electrodes, one for ½-in. electrodes—are supplied with each torch.

ARCAIR Co., P. O. Box 337, Lancaster, Ohio.

Argon Purity Analyzer

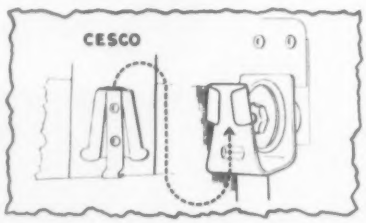
DESIGNED to continuously analyze production processes in the manufacture of welding-grade argon (which must have a purity content of not less than 99.2%), this new instrument is said to be accurate to within 0.01%.

The recorder is normally supplied with two scales. For normal operating, a range of 99 to 100% argon is used to measure the purity of the finished product supplied to the cylinder banks. An auxiliary range of 80 to 100% argon is supplied to measure the crude argon or while starting up the purifying column.

The self-contained unit is ready for operation after the proper current and sample connections are made. Measuring cells are easily interchangeable.

THERMCO LABORATORIES, Johnson Rd., Michigan City, Ind.

* * *



Device for Headgear

MOUNTING device now makes it possible to achieve six combinations of head-protection equipment with only five items. Formerly, 12 items were needed to make similar combinations.

The basis for making these combinations of headgear and helmet, or plastic shield, etc. consists of wedge-shaped brackets that slide together and lock securely. They unlock as quickly. A tilting mechanism allows the user to raise or lower the helmet or shield without difficulty. An adjustable tension spring compensates for the difference in weight of the different pieces.

CHICAGO EYE SHIELD Co., 2300 W. Warren Blvd., Chicago 12.

* * *

Spectacles

DUAL-PURPOSE frame is a feature of these new lightweight plastic safety glasses. The "Saf-I-Spectacle" has a newly styled acetate frame that permits instant change from the regular to the side-shield model. The perforated side shields are of non-flammable, non-sparking acetate and are screwed into place.

UNITED STATES SAFETY SERVICE Co., 1215 McGee St., Kansas City 6, Mo.

Tube Catalog

LIBRARY reference edition of this firm's electronic tube catalog is available to qualified engineers. The 578-page manual is bound in a looseleaf ring binder, with a permanent plasticized cover.

It incorporates all general and operating data on the company's tubes, with specific detail charts and descriptions of every tube it manufactures. The firm makes electronic tubes and tube accessories for industrial and rectification as well as many other applications.

AMPEREX ELECTRONIC CORP., Sales Engineering Division, 230 Duffy Ave., Hicksville, N.Y.

* * *

Contact Electrode

HIGH-SPEED welding can be obtained by use of this new contact electrode. Best suited for work on mild and medium-carbon steel, it is said to be ideal for welding machinery, low-pressure storage tanks and in light structural work. It is suitable for many welding operations requiring E-6012 and E-6020 electrodes.

The firm's engineers state that more metal is deposited per unit of arc energy with this type electrode than any existing covered electrode and that the quantity of deposited metal even exceeds some manual automatic processes.

Encased in a rutile-type covering enriched with iron powder, this contact electrode can be used on horizontal and flat-position fillets and laps, single and multiple-pass butts and deep grooves and cover passes on multiple-pass butt welds. It is said to develop up to 80% less spatter, and resultant weld slag is easily removed by a light tap.

GENERAL ELECTRIC Co., Welding Department, York, Pa.

D-C Arc Welder

DESIGNED for continuous production welding is this new heavy-duty industrial d-c welder of the rectifier type. It is available in four models with 60% duty cycle ratings of 200, 300, 400 and 500 amp. Dual voltage 220/440 is regularly provided.

Optional is a motor-operated amperage control that makes possible the adjustment of welding current by simply pressing a button at the welder. Net weights of the four models range from 500 to 650 lb. Each is 25 in. by 30 in. by 41½ in. high.

BIRDSELL MFG. CO., INC., 750 San Antonio Rd., Palo Alto, Calif.

* * *

Fume Exhauster

WELDING - FUME exhauster collects fumes at the source by an adjustable cone hood which is connected to the exhaust hose. All fumes are drawn into the large cone opening before they can circulate, according to the manufacturer.

The "No. W-200-9" exhauster comes equipped with a heavy-duty pressure blower. The unit works in a radius of 360 deg if mounted on the ceiling or 180 deg if mounted on the wall. Arm and hose assembly can be supplied in various lengths. Also available in portable or standing floor units.

ENGWALD CORP., 357 Lafayette Ave., Brooklyn 38, N.Y.

* * *

Argon Flow Meter

GAGES for recording the flow of argon can be connected to any cylinder or piped system. They require no electrical connections, have an integral needle valve and need no lubrication. The flow meters are available in the following ranges: 0 to 30 liters per minute, 0 to 75 cfh and 0 to 100 cfh.

These instruments are also available in chart speeds of 8, 12 and 24 hours. They weigh 4 lb and measure 5¾ in. square and 2⅞ in. deep.

Another instrument, using the same metering-vane principle, has a 10-in. chart and is calibrated in a range of 0 to 100 cfh. It can be used for either argon or oxygen and has the same chart speeds as those mentioned above.

ELEMATIC EQUIPMENT CORP., 6731 South Chicago Ave., Chicago 37.

* * *

STEEL DATES — 1920: *Experimental work with columbium began in this year. Commercial use of the metal as a steel alloying element followed during the 1930's.*

Now—a new line-up of PAGE welding wire in coils, reels, packages

• Here are some of the ways PAGE welding wires are packaged to protect them during shipment and to make it easy for you to handle and stock them. Two new packages are Leverpaks and pallet-mounted coils.

LEVERPAKS • Here's one of the best containers for coils up to 16″ ID. It's light-weight, but durable. It is sealed air-tight and is packed with moisture-absorbing substance to reduce corrosion. Release safety catch, pull lever, and the whole top comes off. It's just as quickly resealed. Leverpaks can be rolled easily. They stack perfectly and take a minimum of floor space. They cost you nothing extra and have many re-uses.

PALLET-MOUNTED COILS • If you have a fork-lift truck, you'll like PAGE's new pallet-mounting of 22″ ID coils. Steel strapping and paper wrapping protect coils and hold them securely. You can run them in and out of freight cars and trucks, and spot them in your plant.

AUTOMATIC WELDING WIRES • **Inert Gas** — Six PAGE-ALLEGHENY stainless grades in .035″, .045″, and .0625″ diameters. Precision thread-wound on 25-lb. non-returnable reels to fit popular arc welding machines. **Submerged Arc** — PAGE Stainless in wire diameters from 1/32″ to 5/16″, plain or copper coated. In layer-wound coils or 22″ or 24″ mill coils.

GAS WELDING RODS • In a variety of analyses: stainless, Armco, medium and high carbon, and manganese or naval bronze.

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Write our Monessen, Pa., office for literature and prices

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"ONE OF THEIR STANDARD RESISTANCE WELDERS COULD BE THE ANSWER"
● Like any other commodity, when you buy a standard resistance welder instead of a special, you save money and get shorter delivery.
Perhaps you have been thinking in terms of a "special" welder when a standard might do the job. T-W is a logical source because they make more standard spot, seam, flash-butt and projection welders than any other manufacturer, in addition to a wide variety of special welders.
From T-W, you can receive the necessary data on which to base a decision, such as: a comparison of a standard and a special; power requirements (three-phase or single phase); rates of production; welding cost per unit of production; installation recommendations.
Outline your needs to the nearest T-W sales office or the home base in Warren, Ohio. Prompt reply to your inquiry.

Resistance Welders Since 1898

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OAKVILLE AND WINDSOR, ONTARIO

TAYLOR-WINFIELD
RESISTANCE WELDERS

THE TAYLOR-WINFIELD CORPORATION • WARREN, OHIO

Plastic Helmet

SEAMLESS-PLASTIC welding helmet is said to provide both safety and comfort to the wearer because it's strong, yet light in weight. It incorporates the firm's standard ventilation design for cooler welding and prevention of lens fogging.

Available in durable black finish, with or without flip front. With the front, the helmet weighs 29 oz, without 25 oz.

GENERAL ELECTRIC CO., Welding Department, York, Pa.

* * *

Pressure Regulators

NEW pressure regulators are for use with most compressed gases. The "1100 Series" comprises the two-stage models, the "1200 Series" the single-stage models. Both lines are said to afford excellent pressure regulation and a low end point. Each includes many models for use with oxygen, inert gases and fuel gases.

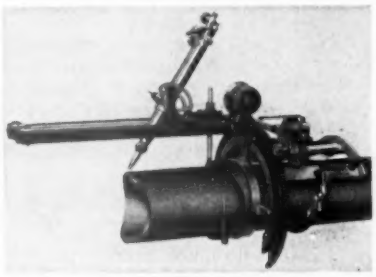
These regulators feature forged, heat-treated, anodized-aluminum-alloy construction, which is said to make them light in weight, compact and rugged. Bodies, bonnets and spring cases are of this alloy.

THE K-G EQUIPMENT CO., INC., 1744 Lehigh St., Allentown, Pa.

CONTOUR CUTTING

Doesn't have to be a hair pulling proposition!

Yeh, Joe won the contract all right . . . the whole ding-blasted works . . . miles and miles of pipe fabrication and some of the darndest shapes to cut you ever saw! Joe lost money on that job. Oh sure, he made a profit, but he could have made more — lots more — with the H & M Shape-Cutter and Beveler. Joe didn't know it but the H & M could have saved **90% of his time** on those contour cutting problems. With the H & M Shape-Cutter all you do is attach the desired cutting pattern to the machine . . . slip the machine over the pipe and snap in place . . . light the torch . . . give the hand crank a few turns . . . and the job is done — the maximum SPEED WITH ACCURACY. Joe had a few choice words for those reject welds too . . . the H & M certainly could have saved him a lot of fuss and bother. If you're in the same fix as Joe get all the details . . .



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H&M **PIPE BEVELING MACHINE CO.**

Trade Mark Reg. U.S. Pat. Off.
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NEW PRODUCT BRIEFS

Electric paddle, called the "Smoothie," is for applying the firm's "Fil-Soder" to cold metal without preheating. SWISS LABORATORY, 1533 Hamilton Ave., Cleveland 14.

* * *

Pressure screw on new C-clamp can easily be adjusted in length. Sliding thumb lock holds the pressure-screw assembly in engaged position. TECHNO PRODUCTS, INC., 1908 E. 66th St., Cleveland.

* * *

Rust-preventative lead coating, known as "Blakled," is believed to be the answer to the corrosion problem of rusting of steel. Can be dipped, sprayed or brushed. U. S. STEEL SUPPLY DIVISION, U. S. Steel Corp., 208 S. LaSalle St., Chicago 90.

* * *

New model of "Adjusto" profile template is 12 in. long. Its laminations are brass strips that are 0.010 in. thick. Right and left-hand threaded member applies pressure to both ends at once, providing additional locking force once the profile has been made. TOOLCRAFT MFG. CO., P. O. Box 507, East Chicago, Ind.

* * *

Chambers for cold treating metals are now available in models producing temperatures as low as —170 F. The new units are equipped with special rotary compressors designed for use with the latest Freon refrigerants. TENNEY ENGINEERING, INC., 26 Avenue B, Newark 5, N. J.

* * *

Heavy-duty vise is mounted on swivel base, which allows full 360-deg rotation. The vise has flanges for clamping down to the machine table, and it may be used with or without the swivel base. CHICAGO TOOL AND ENGINEERING CO., 8383 South Chicago Ave., Chicago 17.

* * *

Two types of high-frequency welding machines have been developed for the plastic-processing industry. The welding electrode cuts out the plastic material around the weld in such a way that superfluous material can be removed easily. Pressure of the electrodes on the welding benches is exerted by means of a pedal. TECHNICAL APPARATUS FACTORY, A. J. Versteege, Rozennobelstraat 4, Zandvoort, The Netherlands.

—McGraw-Hill World News

Get fast, sound AC bronze welds —even on dissimilar metals . . . *use* AMPCO-TRODE "AC" electrodes

USE versatile Ampco-Trode "AC" coated aluminum bronze electrodes and get faster welds on difficult or dissimilar metals. Join cast iron, malleable iron, many nickel alloys, bronzes, bronze to stainless and many others.

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You get Ampco-Trode "AC" in five grades. Brinell hardnesses range from 135 to 300 (3000 kg. load); tensiles from 77,000 to 90,000 psi; yield strengths from 35,000 to 69,000 psi.

Get full information from your nearby Ampco distributor or write us.

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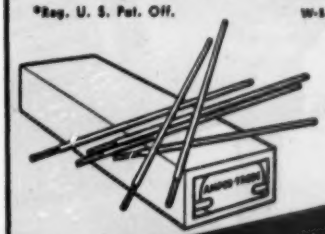

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Dept. WE-4 • Milwaukee 46, Wis.
West Coast Plant, Burbank, California

ANOTHER STEP FORWARD

DOUBLE-SPINDLE MODELS

With this new double-spindle arrangement you can now clamp your work anywhere within the throat gap.

MATERIAL:
Heat Treated Steel Forgings

-2S (Two Spindles) Plier Models

-2S (Two Spindles) "C" Clamp Models

Available in 4 series—Models for 1⅛—2⅞—3⅞ and 5⅞ maximum throat gap.

All models have 2¼ throat depth and a clamping force of 1200 pounds.

Above illustrations show 3⅞ inch throat gap models.

Along with the above, we also offer Pliers and "C" Clamps of other throat gap and depth and a full line of Toggle Clamps for fixed mounting, both manual and air-operated.

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Revolutionary! Forged, heat-treated aluminum alloy

Light, compact, rugged—color anodized! Large capacity, constant flow. Accurate pressure control, 4000 lb. HP gauges. Simple, rugged, easy to repair. Many models in both 1100 Series (two stage), 1200 Series (single stage). See your K-G Distributor, or send for NEW FOLDER.

The K-G Equipment Co. (Inc.), Dept. A., 1744 Lehigh St., Allentown, Pa.

K-G 1100 Series (Two Stage)

DISTRIBUTORS!
Valuable franchises available. Write for details.

Letters should be addressed to: The Editor, THE WELDING ENGINEER, 520 N. Michigan Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if you request it.

Glad You Liked It

Dear Sir:

This morning we received the February issue of THE WELDING ENGINEER, and we are, of course, delighted with the article "Man at Work," which is about our president, James A. Turner, Jr.

Please accept our congratulations for the fine manner in which you have described the rise our company and the personality of the man who is the head of it.

Cordially yours,
William E. Wolff
Advertising Manager
National Welders
Supply Co., Inc.
Charlotte, N. C.

• • •

Author Will Give It

Dear Sir:

I read, with much interest, the article "Welding with Magnetic Flux" by R. A. Hand in the February issue of THE WELDING ENGINEER, which concerned the use of magnetic flux in the semiautomatic submerged arc welder.

We are using such welders at the present time and would like to have more information on, and the source of supply of, the flux and adapter nozzles required on such a welder for the welding of light steel plates.

Thanking you in advance for any help you can give us on this, we are

Yours truly,
W. C. Smith
Smith Tank &
Equipment Co., Inc.
Tyler, Texas

For further information, we suggest you write the author: R. A. Hand, Automatic Welding Specialist, Stoody Co., 11941 E. Slauson Ave., Whittier, Calif.

Long Welded Rails

Dear Sir:

Anent that article "Half-Mile Welded Rails Ride 850 Miles" in the January issue of THE WELDING ENGINEER, a picture of which was also carried on the front cover:

I always was taught, and thought, that a gap between rail ends was absolutely *necessary* to allow for expansion of the steel. This made sense, so I've always accepted it. But rail lengths half a mile long fly in the face of that long-accepted fact and so pose the question: How are such *long* welded-into-one-piece rails kept from buckling or even tearing themselves loose from the ties due to expansion from summer heat? Conversely, how do they prevent such lengths from *breaking* here or there due to contraction in fierce winter cold?

I think the editors of THE WELDING ENGINEER owe it to us readers to at least mention how this problem is met and solved.

Sincerely,
Andrew Vena
Philadelphia 20

The answer is good ballast and heavy spiking.

* * *

Will Do

Dear Sir:

Looking through your February issue of THE WELDING ENGINEER, I was much interested in the story of "77 Years of Resistance Welding" by Pete Hall.

When the series is completed, I would appreciate receiving four sets of tear sheets of this article.

Yours very truly,
F. R. Woodward
The Taylor-Winfield Corp.
Warren, Ohio

* * *

More Kudos for February

Dear Sir:

Your editorial "Are You Wishing or Working?" in the February issue of THE WELDING ENGINEER certainly hits the nail on the head and is applicable to all of our sales organization, so we would be very pleased to receive your authority to reprint this article.

Trusting you will give us your permission, I remain

Very truly yours,
M. H. Potter
Vice-President
Marquette Mfg. Co., Inc.
Minneapolis

We are glad to give you permission to reprint the February editorial.

miller

New Aircrafter

SR-D.C. ARC WELDER

WHEN YOU NEED...

EXCEPTIONAL REMOTE CONTROL!

★ EXTREME CURRENT RANGES

★ FOOT SWITCH FOR REMOTE CONTROL

★ REMARKABLE ARC FLEXIBILITY

★ "UNITIZED" DUAL CURRENT CONTROL

★ INSTANTANEOUS POLARITY SELECTION

And, with these features you get quiet operation, minimized arc blow, long life because of lack of moving parts, top electrical efficiency for low operation cost.

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MILLER ELECTRIC MANUFACTURING CO.
SINCE 1929
APPLETON, WIS.

Why not get the complete story on this new MILLER Aircrafter today . . . see your MILLER distributor now.

When it's... miller ...you know there's none better!

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WELDING WIRE

▶ available in Spools, Coils and Lengths

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Welding wire by Drawalloy is made to an exacting high standard . . . a high standard established by long-experienced welding men who know welding wire and how it must work. Set-ups for automatic and semi-automatic welding take more time than regular welding. That's why you want to be sure of satisfaction *before* you start. This *reliable* wire is weld-tested to give the best results every time. Write today for complete information and prices.

WELDING SUPPLY DISTRIBUTORS: Get prompt delivery on all sizes and grades of stainless and tool steel wire for gas and inert arc welding.

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WELDS LOOK LIKE WART HOGS?

GET PROTECT-O-METAL. Weld spatter simply cannot penetrate Protect-O-Metal—never gets a chance to make your welds look like wart hogs. Just brush or spray P.O.M. on weld area and adjacent surfaces, weld at once, then see how easily all "spatter warts" wipe off with a dry cloth. P. O. M. No. 2 causes no smoke, fumes or odors; is non-dammable and non-toxic. One coat serves for single or multi-pass welds, costs about 1/10¢ per foot, saves up to 85% of weld cleaning labor. Order a trial gallon today. Satisfaction guaranteed.

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POM
GWSMITH
G. W. SMITH & SONS, INC. 5408 KEMP ROAD, DAYTON, O.

Copy for Houston Mayor

Dear Sir:

Want to tell you how much Maybell and I enjoyed the good write-up about our radio program and ourselves ("Radio Pays for Gulf Welding," THE WELDING ENGINEER, February). We have had lots of long-distance calls from our friends regarding it.

I would like to get about four extra copies of the February issue as I have had requests for them from KSOX (now KGBT), the Chamber of Commerce and Roy Hofheinz. Roy built and owned KSOX and sold out to KGBT. He is now mayor of Houston.

Many thanks.

M. T. Hodes
Gulf Welding Supply Co.
Harlingen, Texas

* * *

Want More "How"

Dear Sir:

I enjoy very much reading THE WELDING ENGINEER, but I would like to make the following comment in the interest of improving the overall value of the magazine.

I refer specifically to the *type* of article as exemplified by "Grass Roots of Stress Control" by Joseph Holt, which appeared in the February issue. This article leaves me "cold," for after reading it, I find, in effect, that I have been told about a problem which is already common knowledge to the great majority of people interested in fabrication of welded products. But nowhere is there the slightest inkling as to the procedure used in straightening any of the items discussed or shown in the photographs.

This criticism is in no way intended to be directed at this specific author, but at the type of article. I have read a number of such articles in other magazines recently and have had similar feelings about them.

If an article is to be of some value other than to fill up so much space, it must, in my opinion, have some "meat" in it—in other words *how*.

In the specific article above, a little *how* in the way of simple sketches or descriptions would have added much to its value for a great many readers who recognize the problem but who are unable to make the corrections. I don't believe this sort of thing involves revealing any so-called "military" or trade secrets. I believe, as you have intimated in some of your editorials, that all that is possible should be done to add to the

general knowledge of welding, in order that it become a more and more valuable tool within industry.

The choice to publish this letter or not, I leave to you, since it is intended only as constructive criticism.

Sincerely,
W. H. H.
California

We think your criticism is well taken. The "how" treatment does add interest to an article, and we do our best to secure it in THE WELDING ENGINEER *whenever possible. However, it is not always possible to secure such information, and in that case we are compelled to go ahead with what we have. If you want further information regarding Mr. Holt's methods of stress control, we suggest you write him at 14656 Sixteenth Ave., Seattle 88, Wash.*

Dear Sir:

We found the article "Grass Roots of Stress Control" by Joseph Holt in the February issue very interesting. We also found that the article did not tell *how* to "stress control" with heat.

I am sure that anyone who reads this interesting article would say the same thing.

Very truly yours,
George A. Kurnath
Metalfab, Inc.
Rochelle Park, N. J.

* * *

More "Grass Roots"

Dear Sir:

In the February issue of THE WELDING ENGINEER there is an article by Joseph Holt entitled "Grass Roots of Stress Control," in which I was quite interested. If you make a practice of sending tear sheets upon request, I would be interested in receiving copies of this article.

Thank you,
J. H. Cates
Columbia-Southern
Chemical Corp.
Corpus Christi, Texas

* * *

Dear Sir:

In your February issue of THE WELDING ENGINEER, your article by Joseph Holt on "Grass Roots of Stress Control" interests me very much.

Should further information on this subject be available, I would sincerely appreciate your advice or the address to where I may write for further inquiry. Thank you.

Yours truly,
N. C. Langlois
New Bedford, Mass.

For Mr. Holt's address, see the above editor's note.

Gasweld REGULATORS

RUGGED! PRECISE! DEPENDABLE!

here's the inside story

LARGE DIAPHRAGM for extra sensitivity and finger-tip control.

STAINLESS STEEL NOZZLE for smooth flow control.

CARTRIDGE TYPE SEAT—Slips in place—Simplifies alignment problems.

STRAIGHT THREAD INLET with ball seat for easy replacement.

PLUNGER AND SPRING assure smooth seat operation and positive seat closure.

LIQUID also produces Oxygen, Acetylene and other commercial gases including CO_2 in all its forms—Gas, Liquid or Solid (dry ice) for industrial use.

The R-44 Series shown is one of a complete line of Gasweld single and two-stage regulators. All are ruggedly built, simply designed, completely dependable. One of them is perfectly suited to *your* operation.

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WELDING SHOW

MEMORIAL AUD. BUFFALO — May 5-7

FREE CATALOGS

LIQUID manufactures a complete line of both gas and arc welding equipment and supplies. Send for your Gasweld and Arc Welding Catalogs today.

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any way you look at it . . .

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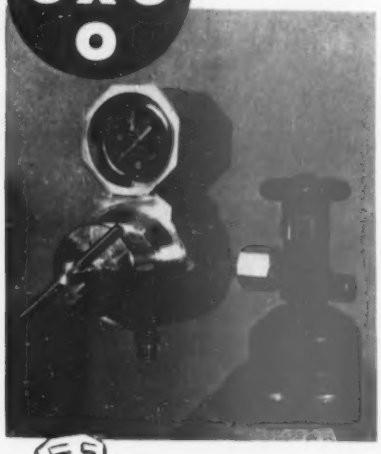

REDUCES OPERATING COST 90%

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Patented Guard protects Gauges.

Patented internal parts replaced in less than two minutes with only one size common socket wrench.

Stainless Steel tank connections for safety and long life.

America's largest Industrial Plants and Construction Companies are switching to OXO REGULATORS.

OXO WELDING EQUIPMENT COMPANY

1235 West 95th Street, Chicago 43, Illinois

We Agree, Definitely

Dear Sir:

For over forty years, arc welding has been a big factor in building the modern equipment used by man in every walk of life. However, progress is now being held back by limitations placed around the welding process by various codes, rules and regulations which are unduly severe.

These restrictions are promoted, no doubt, by well-intending persons but persons who do not see the economic folly of what they are doing. Arc welding has produced a record for reliability in billions of welds, over the years, that is unmatched by any other manufacturing process. Yet arc welding is being tremendously handicapped in its application. This handicap is throwing suspicion on the process by writing into specifications expensive and impractical tests which have little to do with the excellence of the weld. Most of them have to do with infinitesimal variations of no possible importance but high cost.

These restrictions have already eliminated the economic use of welding in many proper applications and, if continued, will eliminate many others.

With modern arc-welding equipment and electrodes and with proper technique, it is almost impossible to make a weld which will be weaker than a riveted joint.

We see welding electrode specifications being written, however, which enormously increase the cost of production with no increase in either the reliability or in the excellence of the structure.

Much time and expense is used in testing electrode deposits to make sure they have great ductility. The weld is rejected if its ductility is low. Yet riveted joints have no ductility, relatively speaking, and are accepted without question.

. . . This continued suspicion of the engineering profession toward welding, in spite of its enviable record, does not reflect credit on the profession.

It is high time that welding be given its proper place in manufacturing methods, without restrictions which are harmful. This will save the consumer hundreds of millions of dollars each year in lower cost of present structures and the making possible of a tremendous number of other structures now eliminated by these impractical and unscientific rules.

Very truly yours,
J. F. Lincoln,
President,
The Lincoln Electric Co.
Cleveland 17

Tempilstik®

the amazing Crayons that tell temperatures

A simple method of controlling working temperatures in:

- WELDING
- FLAME-CUTTING
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It's this simple: Select the Tempilstik® for the working temperature you want. Mark your workpiece with it. When the Tempilstik® mark melts, the specified temperature has been reached.

$2 each

gives up to 2000 readings

Available in these temperatures (°F)

113	263	400	950	1500
125	275	450	1000	1550
138	288	500	1050	1600
150	300	550	1100	1650
163	313	600	1150	1700
175	325	650	1200	1750
188	338	700	1250	1800
200	350	750	1300	1850
213	363	800	1350	1900
225	375	850	1400	1950
238	388	900	1450	2000

Also available in pellet or liquid form.

FREE —Tempil® "Basic Guide to Ferrous Metallurgy" — 16¼" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

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New York 10, N. Y.

VISIT OUR BOOTH #144 AT THE WELDING AND ALLIED INDUSTRY EXPOSITION, BUFFALO, MAY 5-7

NEWS . . . . . *from page 6*

Goodyear Undertakes Program on Resistance Welding

A RESISTANCE welding development program now under way at the Goodyear Aircraft Corp., Akron, Ohio, stands to benefit the nation's aircraft industry. The Air Materiel Command, Wright-Patterson Air Force Base, Ohio, has authorized Goodyear to proceed with a program intended to broaden the scope of economical application of resistance spot, roll-spot and seam welding in the fabrication of non-ferrous components of aircraft and missiles.

Battelle Memorial Institute, Columbus, Ohio, is assisting in the program, under subcontract to Goodyear. First phase of the 30-month program has Goodyear and Battelle engineers screening, summarizing and evaluating all available data (published or unpublished) dealing with the resistance welding of magnesium, aluminum, titanium and their alloys.

Subsequent phases include the refinement and further development of welding techniques, re-determination and modernization of requirements and limitations for spot and seam welding performed on modern equipment and redesign and fabrication of structural components by welding for test purposes.

Both the Air Force and Goodyear have received the cooperation of numerous manufacturers, who will supply information concerning present practices and suggest possible avenues of attack.

J. F. Snider, assistant manager of technical service, is in charge of program coordination at GAC. Technical details are being handled by M. W. Seese, chief welding engineer.

* * *

OPENING of Southern Oxygen Co.'s new Philadelphia quarters was the occasion for this handshake. R. B. Swope (left) is congratulating Rudi Guenzel (right), manager of the Philadelphia branch. In center is Howard Snuggs, manager of the Kingsport, Tenn., branch.

NO MATTER WHERE YOU ARE

GB's Distributor Sales Organization is made up of experienced salesmen who have a broad background of practical operating experience, as well as technical training, in silver brazing applications. One of those men is in your area—and he wants to work with you to find how GB Silver Brazing Alloys and GB Fluxes will speed up your operations, give you maximum results and save you money.

Each GB standard Silver Brazing Alloy is developed for specific cost and production requirements. They are all available in these easy-to-use forms . . . wire in coils or straight lengths, strips, sheets, simple or intricate formed pieces.

Call in your GB distributor for all the facts about the GB line—he'll gladly supply you with working samples of GB alloys and fluxes, as well as give you helpful assistance on any brazing problems you may have. (If you don't know his location, simply write us and we'll send his address.)

GB FLUXES . . . available in three main types to cover the low temperature silver brazing range:
GB No. 99—working range up to 1350° F
GB No. 88—working range up to 1650° F
GB No. 27—working range up to 2000° F

GB FLUXES . . .
Dissolve metallic oxides readily
Provide uniform flow of silver brazing alloy
Insure high joint strength

GB FLUXES

The physical properties and appearance of a brazed joint are controlled to a large degree by the flux which is used. For this reason it will pay you to team-up GB Flux with GB Silver Solder—they were developed to produce maximum results when used together.

GOLDSMITH BROS.
SMELTING & REFINING CO.
1300 W. 59th, CHICAGO, ILL.
Suppliers of Precious Metals to Industry Since 1867

BEST for LESS
EYEGARD IMPERIAL GOGGLES

The latest and greatest development in eye protection and comfort. In quality, the finest that years of experience and technical "know-how" could produce—yet priced well below what you would expect to pay. Six styles—cover-all and regular—write for literature and prices.

- Uses standard 50 MM round lenses
- 22% larger than ordinary goggles
- More ventilation through cup slots —no fogging of lenses
- Feather-weight aluminum rims and side shields
- Face shaped contour to fit snugly, comfortably
- Available with or without metal adjusting top bar

#500 WELDERS COVER GOGGLES with baffled side shields

#501 CHIPPERS AND GRINDERS COVER GOGGLES with perforated side shields

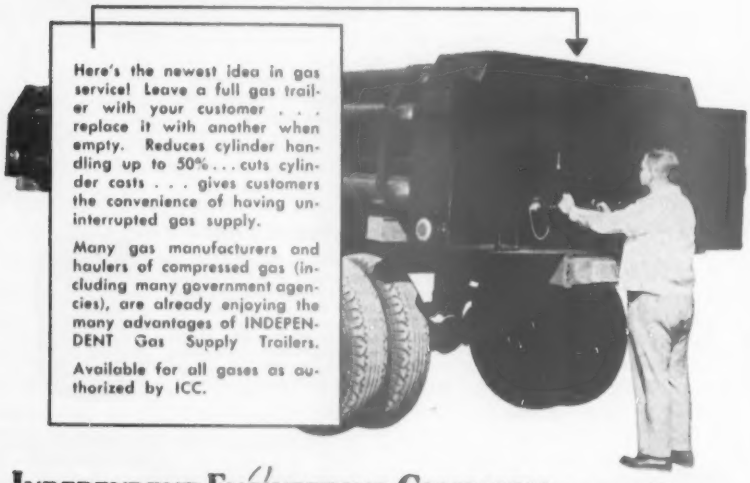
AMERICAN INDUSTRIAL SAFETY EQUIPMENT COMPANY
3503 LAKESIDE AVENUE CLEVELAND 14, OHIO
Division of The Burdett Oxygen Company, Cleveland, Ohio

REDUCE CYLINDER HANDLING
Up to 50% with INDEPENDENT Gas Supply Trailers!

Here's the newest idea in gas service! Leave a full gas trailer with your customer . . . replace it with another when empty. Reduces cylinder handling up to 50%... cuts cylinder costs . . . gives customers the convenience of having uninterrupted gas supply.

Many gas manufacturers and haulers of compressed gas (including many government agencies), are already enjoying the many advantages of INDEPENDENT Gas Supply Trailers.

Available for all gases as authorized by ICC.



INDEPENDENT ENGINEERING COMPANY, Inc.
CONSULTING · RESEARCH · DESIGNING
Manufacturers of
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN
O'FALLON 5, ILLINOIS
We Invite Your Inquiries

Some Welding and Allied Firms in Tool Show

FIRMS in the welding and allied fields which will be among the exhibitors at the exposition sponsored by the American Society of Tool Engineers, to be held in Philadelphia April 26-30, include the following:

American Chain & Cable Co., Inc.; American Wheelabrator & Equipment Corp.; Ampco Metal, Inc.; Armor-Tuf Sales Corp.; Bausch & Lomb Optical Co.; Handy & Harman; Haynes Stellite Co.; Division of Union Carbide and Carbon Corp.

* * *

Tunnel Shield Is Welded

SAID to be the first of its kind, a tunnel shield using an all-welded steel shell and internal structure was to have been completed last month at the Schenectady, N. Y., plant of American Locomotive Co. Considered stronger than conventional riveted shields, it will be used to bore the third tube of the Lincoln Tunnel through the Hudson River bed.

The rings that form the lining of the tunnel tube are erected in the tail of the shield after it has been thrust through the river bed under tremendous pressure.

The shield weighs 240 tons and is 31 ft 8 in. in diameter and 18 ft 4 in. long.

* * *

New House Organ Discusses Welding

MOISTURE and similar welding problems will be discussed in "Welding Views," a new house organ being published by Fred C. Archer Co., Milwaukee, manufacturer of the "Aridair" electrode-moisture stabilizer. The main purpose of the new publication will be to familiarize management, shop men and dealers with the necessity for stabilizing the moisture content of stainless-steel and low-hydrogen electrodes.

A $100 prize is being offered in a current contest, which closes April 15, for the best letter on the use of the firm's stabilizer. Dealers and users are eligible.

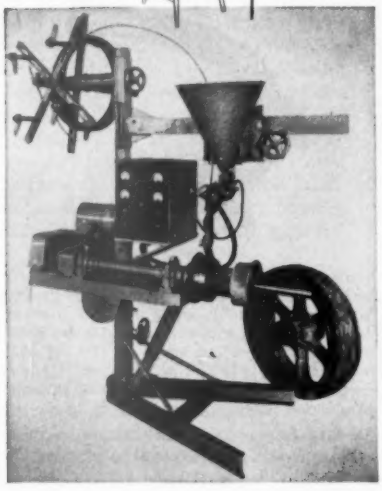
* * *

Do You Know What Metal?

What metal can be welded without heat and without pressure? It is not necessary to clean the surfaces before welding, and there is no shrinkage involved after welding. If you don't know, you can find the answer on page 87.

WELDING THAT IS

Really Automatic



- Rebuild Crawler Type Tractor Rails, Rolls, Idlers
- Special Applications Engineered
- Tanks - Pipe - Drums - Shafts
- Beams - Channels - Plates - Bars

REXARC
AUTOMATIC WELDERS AND POSITIONERS

Let us send you Complete Information

THE SIGHT FEED GENERATOR CO.
55 EAST THIRD STREET
WEST ALEXANDRIA, OHIO, U.S.A.

Plan Expansion of Wall-Derkiss Firm

IMMEDIATE expansion of the plant and field-service facilities of Wall-Derkiss, Inc., has been announced by A. F. Wall, president of Wall-Colmonoy Corp., Detroit, who recently acquired a substantial interest in the new firm and is its new president.

Located at Linden and Perth Amboy, N. J., the company was formerly Derkiss Lead Burning Contractors and Derkiss Fabricators, Inc. The expansion plans call for immediate work on regionally located plants and facilities at Montabello, Calif.; Blasdell (Buffalo), N. Y.; Houston, Texas; Morrisville, Pa.; Montreal, Canada; and Lanarkshire, Scotland.

Wall-Derkiss fabricates stainless, carbon and alloy steels and applies lead by a loose-lining or homogenizing process to various equipment such as pipe, tanks and coils. It also makes pressure vessels, storage and pickling tanks, bins and hoppers and structures. Field work on contract is another activity.

Mr. Wall also announced the appointments of A. J. Allen, vice-president of Wall-Colmonoy, as executive vice-president; M. N. Levers as vice-president in charge of sales; and J. Masters as plant manager of Wall-Derkiss. John H. Kisslan, owner of the predecessor companies, will continue as vice-president and consultant as well as a member of the board. For health reasons, he had declined an administrative post.

The new company will continue with the personnel of the former companies and will be staffed as a completely separate organization, Mr. Wall stated.

* * *

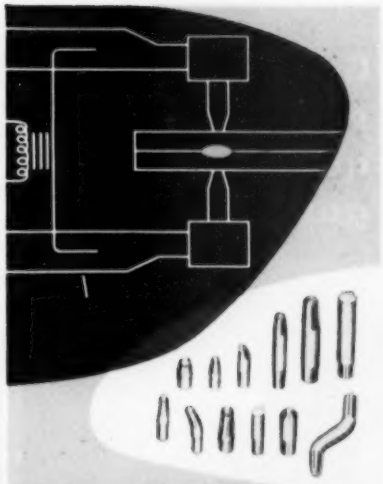
Aluminum Skyscraper Subject of Film

THIS country's first aluminum skyscraper—the 30-story Alcoa Building in Pittsburgh—is the subject of a 28-minute motion picture recently released by the Aluminum Co. of America. Entitled "Aluminum on the Skyline," the 16-mm movie depicts the design and construction of the firm's office building.

* * *

Vapor Heating Corp. Moves to New Site

VAPOR Heating Corp. (an article about which appeared in the March issue of THE WELDING ENGINEER) recently moved to its new plant at 6420 W. Howard St., Chicago. It was formerly located at 4501 W. 16th St. in the same city.



Good tips for resistance-welding machine users

AMPCO WELD*

spot-welding tips cut costs, downtime; increase production

Ampco Weld spot-welding tips can take it. Manufactured under rigid laboratory control at Ampco's own plants, they resist mushrooming and wear and their high electrical conductivity minimizes sticking to the work.

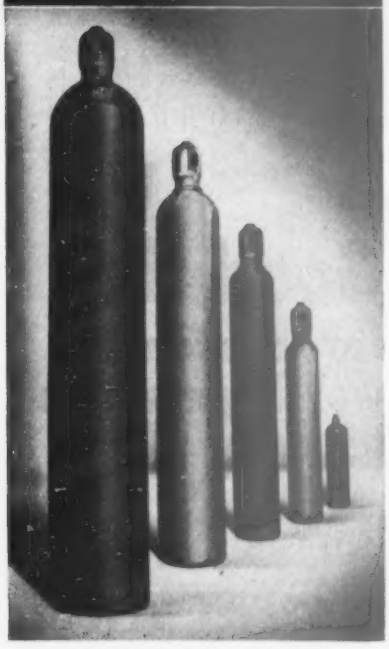
This outstanding combination of properties results in a resistance-welding electrode that requires fewer dressings and pays off in longer runs, reduced downtime, lower costs.

Ampco Weld tips are only part of a complete line of resistance-welding products, not only meeting but exceeding RWMA specifications. Ampco Metal, Inc. gladly furnishes engineering service for special applications. Step up your production — order Ampco Weld resistance-welding tips now.

*Reg. U. S. Pat. Off., Ampco Metal, Inc.

AMPCO
Ampco Metal, Inc.
Milwaukee 46, Wisconsin
West Coast Plant: Burbank, California
It's production-wise to Ampco-ize!

Go to cylinder specialists for quality oxygen gas cylinders



It stands to reason: there is no substitute for experience. *Harrisburg Steel* is the pioneer and world's largest manufacturer of high-pressure gas cylinders made to I.C.C. specifications. And for decades, *Harrisburg Steel* has built reliable cylinders for all branches of the Welding industry . . . cylinders possessing extra margins of *quality* and *safety* . . . cylinders that perform better and last longer. Capacities range from 14 to 400 cubic feet . . . they are manufactured in both Domestic and Export types. The next time you order oxygen gas cylinders, may we suggest that you entrust your order to *Harrisburg Steel*. Meanwhile, write for catalog and current prices.

HSC-W-1/54

101 Years in Pennsylvania's Capital
Harrisburg Steel
CORPORATION
HARRISBURG 19 PENNSYLVANIA

Nippes Continues Research for Wright Air Center

AUTHORIZATION to continue until September a program of research he undertook in July, 1952, has been given Dr. Ernest F. Nippes by the Wright Air Development Center near Dayton, Ohio. Nippes, head of welding research at Rensselaer Polytechnic Institute, Troy, N. Y., and his associates are making studies and experimental investigations into the flash welding of alloyed steels.

* * *

Basic Materials Show in Chicago May 17-20

CHICAGO will be the site of the Basic Materials Conference, which will be held May 17-20. A Basic Materials Exposition will be held during the same period in the International Amphitheatre.

* * *

Alloy Rods Co. Dedicates Western Electrode Plant

SEVERAL hundred persons were on hand recently when the Alloy Rods Co., York, Pa., formally dedicated its new Pacific Coast division manufacturing plant at 750 Lairport St., El Segundo, Calif. The new plant is designed to care for the alloy welding electrode needs of western industries. Its sales and manufacturing facilities will service distributors in 11 western states.

George M. Hohman is plant manager at El Segundo. Attending the dedication from the York home plant were E. J. Brady, president and founder; M. G. Sedam, executive vice-president; R. K. Lee, vice-president, research; E. R. Walsh, III, general sales manager; and F. L. Blodgett, assistant general sales manager.

PRESENT at dedication of Alloy Rods Co., Pacific Coast plant were (left to right) E. R. Walsh, III, general sales manager of Alloy Rods, and T. D. Aller and Marvin Pearson, both of Southwest Welding & Mfg. Co. (See story above.)

sellstrom safeguards designed for comfort

HEAT WAVE AHEAD!

Leather Sweat Bands
for Helmets and Face Shields
Stop Hot Weather Perspiration Hazards

Summer heat is becoming more and more intense and the entire world is becoming warmer says the January issue of Coronet Magazine. You know that when the thermometer "shoots" up to 95 or 100 the heat wave is here. It brings perspiration, discomfort, slowdown of work and loss of valuable production time.

To largely overcome this perspiration hazard, employers are more and more using the Sellstrom No. 442 and 443 genuine leather sweat bands.

All Sellstrom helmets and face shields are equipped with these genuine leather sweat pads. If yours are more than a year old, you may benefit by replacing them before hot weather arrives.

You may also be using helmets and face shields which are not equipped with genuine leather sweat bands just like the one in your hat. Sellstrom leather sweat bands can be attached to any headgear in a few seconds because they are snapped on and held in place by glove fasteners. When ordering Sellstrom Leather Sweat Bands, be sure to order the proper width.

No. 442—Leather Sweat Bands for 1¼ inch headgear band.

No. 443—Leather Sweat Bands for ⅞ inch headgear band.

For prices see our No. 31 catalog. Every Sellstrom leather sweat band pays for itself again and again because it increases hot weather working efficiency.

If your dealer does not have these sweat bands in stock, he can order them for you or you can write us direct.

sellstrom
MANUFACTURING COMPANY

Eye and Face Safeguards—Designed for Comfort

626 N. Aberdeen Street Chicago 22, Ill.

Metallizing Engineering Co. Building New One-Story Plant

SCHEDULED to be completed by July 31, a new one-story plant is being built at Westbury, Long Island, N. Y., by Metallizing Engineering Co. The firm is presently located in Long Island City. The modern structure will occupy 65,000 sq ft of a seven-acre tract. It will include 20,000 sq ft of office space and 45,000 sq ft of manufacturing, storage and shipping areas. The building is being constructed from brick masonry, steel and glass.

* * *

Worthington Takes Over Mueller Furnace Co.

ANNOUNCEMENT was recently made of an agreement between the Worthington Corp. and the L. J. Mueller Furnace Co., Milwaukee, whereby the latter will become a division of the former. Mueller stockholders were to have voted upon the proposal. Under the plan, the Mueller plant and facilities would be operated as the Mueller Climatrol Division of Worthington.

* * *

ASME Approves GR40A for Pressure Vessels

ALUMINUM alloy GR40A (designation of American Society for Testing Materials) has been approved by the boiler code committee of the American Society of Mechanical Engineers for use in construction of unfired pressure vessels.

Aluminum Co. of America, whose commercial designation of the alloy is A54S, claims GR40A offers higher mechanical properties than the alloys previously approved for welded pressure vessels. The alloy is said to be even more desirable at elevated-temperature operation because it maintains its strength better at higher temperatures.

Although A54S can be welded by all conventional methods, Alcoa states the Tig (tungsten inert-gas) and Mig (metal inert-gas) processes are preferred.

Answer to Metal Problem

The metal that can be welded without heat and without pressure is frozen mercury. When two surfaces are brought together they stick to each other on contact only, which fact makes possible the success of the mercury casting process. The only catch is that it takes a low temperature to weld mercury—about —40 Fahrenheit.

Photo Courtesy Peerless Welding Co., St. Louis, Mo.

✓ THE MECO CIRCLE MIXER—Correctly proportions welding gases for maximum efficiency and superior results without creating the least resistance to their flow.

✓ SPRING TENSION NEEDLE VALVES—Insure permanent adjustment at any point. Adjustments can be accurately made and held in place regardless of bumping or jarring of welding handle.

✓ ARMORED GASKET TYPE JOINT—Provides a leak-proof seal between torch handle and mixing chamber, or torch handle and cutting attachment—minimizes wear.

Meco

FREE—send for New MECO Catalog No. 150 today!

Modern Engineering CO., Inc.

3411 PINE BLVD. ST. LOUIS 3, MO.

MANGANAL
U. S. Patents 1,876,738 - 1,947,167 - 2,021,945
11%-13½% Manganese-Nickel Steel
APPLICATOR BARS
and
WELDING ELECTRODES
Rebuild Worn
HAMMERMILL HAMMERS
Quickly and Easily!
It's the NICKEL in MANGANAL that makes welding and fabricating easier; and it's the MANGANAL Applicator Bars that allow you to rebuild Hammermill Hammers quickly because you minimize build-up time.
Mill Depot Stocks: Newark • Wilkes-Barre (Forty Fort) • Indianapolis • Minneapolis
"HOW TO DO IT" DETAILS SENT ON REQUEST
NEAREST DISTRIBUTOR UPON REQUEST
SOLE PRODUCERS 92 N. J. RAILROAD AVE. NEWARK, N. J.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT

For Welding and Cutting . . .

NATIONAL CARBIDE

in the red drum

HIGHEST QUALITY
DUST FREE

Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

National Carbide Company

GENERAL OFFICES: 60 EAST 42ND STREET, NEW YORK 17, N. Y.

A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

New **One-Package**

DryRod Electrode Oven

Gives ON-THE-JOB Protection for Low-Hydrogen and Stainless Steel Rods!

NOW YOU CAN HAVE full protection on scattered, isolated jobs for your low hydrogen, stainless steel or other special alloy electrodes . . . with new bantam-size Model 10 DryRod Electrode Oven! Lightweight, Model 10 goes everywhere operator can work . . . holds full 10-lb. package of 14" rods . . . protects against moisture absorption with even, continuous flow of heat. Saves on costly rejects, reworks, scrap loss just like larger DryRod Models—Yet costs less than $50, fully wired, 110-volt AC! Ideal for large, diversified plants and shipyards . . . oil fields and construction jobs . . . installation on mobile service units . . . or as regular unit in smaller shops. See your dealer, or write for full information TODAY!

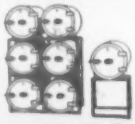
DryRod—Trademark—X-DR-15

Portable Unit Saves 4 Ways Like Other Models:

1 Store sealed cartons in warm, dry place.

3 Locate DryRod as close to welding operations as possible.

2 Place unpackaged electrodes in DryRod Oven and withdraw as needed.



4 For flexible, large-volume storage, stack ovens with compact DryRod Stands.

DryRod DIVISION OF Phoenix Products Co.
4715 N. 27TH ST., MILWAUKEE 16, WIS.

New Welding Supply House Operated by Woman

ANOTHER addition to the rapidly growing national list of welding supply distributors is The Boston Welding Supply Co., 293A Boyleston St., Brookline, Mass., which is owned and managed by a woman who has been associated with the welding industry for the past 11 years. Her name is Christy Hanson. Mrs. Hanson employs four welding engineers, who cover the New England area. She also maintains a branch office at 700 Washington Ave., Portland, Me.

* * *

Petroleum Group Publishes Standards on Pipe Welding

PUBLICATION of the "Tentative Standard for Field Welding of Pipe Lines" was recenty announced by the American Petroleum Institute. Copies of this "Standard 1104, Second Edition" may be obtained from the API, 50 W. 50th St., New York City 20, at 50 cents per copy. The publication was prepared by a committee representing the American Gas Association, Pipe Line Contractors Association, National Electric Manufacturers Association and the API.

* * *

Welding Used in New "Application"

PRACTICAL jokers can usually find a use for everything, including welding.

In Cleveland recently, two workers welded a dime to the head of a spike, then drove the spike into a crack of a sidewalk. After retiring to a store in which they were working, the two men, watching from peepholes, saw the results of their deception: Large numbers of persons, swallowing the bait, tried to pick up the dime; then, probably looking abashed, they gave up the struggle and silently slunk away.

* * *

Distributor Appointments

Stoody Co., Whittier, Calif.: Consolidated Welding Supply Co. and Phoenix Welding Supply Co., both of Phoenix, Ariz.; Laird Welding & Mfg. Works, Merced, Calif.; Welding Service Co., Savannah, Ga.; Waterville Welding Supply, Waterville, Me.; General Distributing Co., Butte, Mont.; Quanrud, Brink & Reibold, Inc., Glendive, Mont.; McRary & Son, Inc., Asheville, N. C.; Welders Needs, Inc., Toledo, Ohio; West Texas Welder's Supply, Midland, Texas; Taylor-Simpkins, Inc., Monahans, Texas.

ARCAIR TORCH does big cutting job for GATX

When the maintenance division of General American Transportation Corporation needed a new and better answer to metal cutting problems, they found it in the Arcair Torch.

At the East Chicago repair yard of GATX, the job involved replacement of cast stainless steel doors on hopper cars specially built for transporting corrosive materials in bulk. The one-ton castings had been so badly damaged that it was necessary to cut away cracked and crushed sections and reweld new sections in their place.

Even with extreme care, ordinary methods of cutting resulted in contamination of stainless steel surfaces by the formation of carbon or iron deposits.

Using the Arcair Torch to cut stainless steel castings is but one of its many applications at GATX.

With the Arcair method of cutting, using only carbon arc and compressed air, formation of contaminating deposits was negligible. GATX supervisors were more than pleased, too, by the smoothness of the cut. Smooth, even cuts meant easier and faster rewelding without chipping or grinding.

More Arcair Torches have since been ordered for use in other GATX shops for many different jobs. For instance, in the salvage operations of GATX, the Arcair Torch is now used to sever bolsters, couplers, heavy castings and other parts from retired cars. Clean cuts often enable the components to be immediately rewelded to other cars with no grinding or machining.

Many industrial users, like GATX, have found that the Arcair Torch does difficult gouging and cutting jobs at low cost, and results in valuable salvage recovery.

Write for free bulletin with facts and photographs of time and money-saving applications of the Arcair Torch.

ARCAIR COMPANY
EASTERN DIVISION:
P.O. Box 337, Lancaster, Ohio
WESTERN DIVISION:
P.O. Box 4227 Bremerton, Wash.

Arcair TORCH

R. C. HOLBROOK, president of Liquid Carbonic Canadian Corp., Montreal, and a board member of the Liquid Carbonic Corp., Chicago, has been elected president of the Compressed Gas Association.

* * *

L. W. JORDAN has been appointed vice-president, Pacific Region, of the Linde Air Products Co., New York City. He will make his headquarters in San Francisco. With Linde since 1925, Mr. Jordan has served as a salesman, sales correspondent and district manager. In 1935 he was appointed manager of the Pacific Coast Region, which roughly encompasses all territory west of the Rocky Mountains.

* * *

FRANK P. DITORO, formerly Atlantic and Eastern district manager of THE WELDING ENGINEER, has been named sales manager of the magazine, a newly created post. EDWARD P. GARDNER succeeds him as district manager. Mr. DiToro has been with McGraw-Hill since 1951. Mr. Gardner was formerly a salesman with the American Bank Note Co. Both men have their headquarters in New York City.

* * *

HELMUT THIELSCH has been appointed metallurgical engineer of the industrial piping division of Grinnell Co., Inc., Providence. He will be concerned with the preparation of specifications, approval of materials for welding and metallurgical and welding research. He will also represent the firm on several major technical committees concerned with the fabrication of piping.

* * *

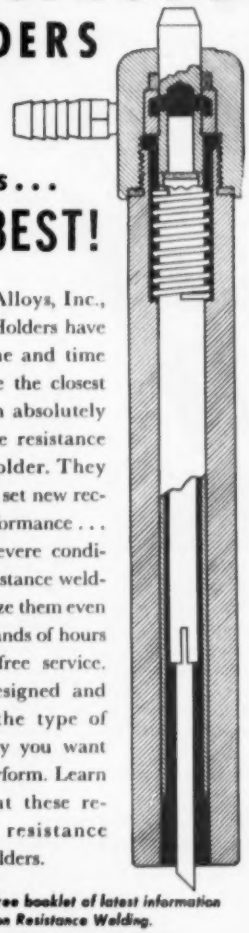
A. B. DRASTRUP has been elected executive vice-president of the A. M. Byers Co. J. F. BYERS, JR., and B. M. BYERS were elected vice-presidents of the company.

Here are the

7 "MUSTS" *in selecting* RESISTANCE WELDING HOLDERS

1. Leak-proof, positive Water Flow
2. High Conductivity
3. Simplicity of Design
4. Simple Maintenance
5. 100% Rust-Proof Construction
6. Rugged . . . Long-Lived
7. Non-Magnetic Throughout

Specify WW ELECTRODE HOLDERS *on all counts...* THE BEST!



Yes, WW Alloys, Inc., Electrode Holders have proved time and time again to be the closest thing to an absolutely trouble-free resistance welding holder. They continue to set new records of performance . . . the most severe conditions in resistance welding don't faze them even after thousands of hours of trouble-free service. They're designed and built for the type of rugged duty you want them to perform. Learn more about these remarkable resistance welding holders.

Send for free booklet of latest information on Resistance Welding.

WW ALLOYS, INC.

42804A

Division of Fansteel Metallurgical Corporation
11644 Cloverdale Ave. - Detroit 4, Michigan

SPATTER CHATTER

Independent Research Proves Superiority of Cam-Lok Connectors

"Lowest resistance of all connectors tested!"

SEE OUR BOOTH 146 WELDING SHOW MEMORIAL AUDITORIUM BUFFALO—MAY 5-7

A world-famous manufacturer of welding equipment recently tested Cam-Lok Cable Connectors against competitive connectors. With a 400 ampere load, the Cam-Lok Connector showed only 10.6 millivolt drop, indicating negligible resistance. In comparison, a solid brass bar, the same size and shape as the Cam-Lok Connector, showed 5.8 millivolt drop, proving that the Cam-Lok Connector is almost as efficient as a solid piece of brass.

- Double-Cam principle assures most perfect contact possible
- Solid brass, precision machined
- Positive vibration-proof connection
- No weaving, no arcing, no heating, no burning
- Time, money, trouble-saving interchangeability

cam-lok
DIVISION OF EMPIRE PRODUCTS, INC.
P. O. Box 98-N Cincinnati 36, Ohio

WRIST watch is presented to Ted Nowak (right) by Vice-President A. F. Davis, of Lincoln Electric Co.

TED J. NOWAK has been named "Man of the Year" of The Lincoln Electric Co.'s rural sales staff. He is the Cleveland firm's regional rural dealer sales manager in Indianapolis. His selection was based on personal achievement and self-improvement in the management of his territory. Mr. Nowak was awarded a gold wrist watch. Last year his development in the rural sales organization produced the largest volume of farm business out of the Indianapolis territory in the company's history.

* * *

W. D. JOHNSON has been appointed general superintendent of all liquid gas plants of The Liquid Carbonic Corp.'s Compressed Gas Division, with headquarters in the Chicago general office. He will be responsible for the operation of the corporation's industrial, medical and carbon dioxide gas plants. Mr. Johnson was formerly assistant general manager of engineering and development for the Great Lakes Carbon Corp.

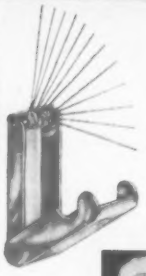
* * *

Pennsylvania Optical Co., Reading, Pa., has announced the following sales appointments: EDWARD L. CLARK will serve the Cleveland area; his headquarters will be at 6318 Thornton Drive, Parma 29, Ohio. ROBERT SPEIDEL will serve the Detroit area from his headquarters at 22150 Westhampton Ave., Oak Park, Mich.

* * *

Wall Colmony Corp., Detroit, has added two sales engineers to its staff. A. D. ARNAUT has joined the New York district sales force, and M. R. PRICE has joined the force of the Pittsburgh district.

Welding Engineers prefer THERMO spiral tip cleaner design...



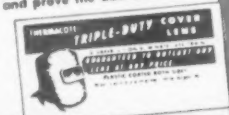
So do welders because they know how the spiral design of Thermo Tip Cleaners removes carbon and slag without scratching or enlarging. Buy Thermo Spiral Tip Cleaners in handy metal case. 12 sizes.

Precision manufactured and guaranteed unbreakable or replaced free.

SAVE 95.5% ON COVER LENS COST

Send for free sample of the Triple Duty Cover Lens and prove the above claim.

At all Welding Supply Dealers



THERMACOTE CO.
NEWARK • CHICAGO • LOS ANGELES

NOW PIERCE LONG RANGE UNIVERSAL GOVERNOR

fits 9 out of 10 industrial gasoline engines

•

gives long range speed selection

•

accurate "variable speed" or "constant speed" engine control between 1200 and 2200 RPM

•

Pierce is the most widely used governor for engine-driven welders

•

See your dealer or write to:

THE PIERCE GOVERNOR CO., INC.
1618 Ohio Avenue
Anderson, Indiana

WORLD'S MOST EXPERIENCED GOVERNOR MANUFACTURER

"Red Head"
WELDING CLAMPS
• Designed for Welding •
No Threads To Damage

1. Case hardened threads are always protected from weld spatter and never exposed to damage in open or closed position.

2. The clamp body is cut from solid plate, thereby insuring extreme rigidity and giving great resistance to bending or twisting.

3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

23 stock sizes

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J. R. SPENCE has been appointed vice-president of Victor Equipment Co.'s Alloy Rod & Metal Division, Los Angeles. He had been division manager. Both the Los Angeles and Wakita, Okla., plants will be under his direct supervision. The company, the main offices of which are in San Francisco, is formulating plans for construction of a new Los Angeles plant to handle future expansion of the division.

* * *

JOHN H. MCFEETERS, formerly associated with The Lincoln Electric Co., has joined The Robert H. Newton Co., Cleveland, in a sales-executive capacity. The Newton firm is agent for welding-equipment manufacturers. His immediate duties will be the development of sales in northern Ohio. Mr. McFeeters for a number of years taught welding in Joplin, Mo., trade schools. He joined Lincoln in 1945 and his last sales assignment for that company was in Emeryville, Calif.

* * *

TRAVER E. HARTILL has been appointed public relations representative for the Chicago District of U. S. Steel Corp.

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for Welding of
ALUMINUM

ELECTRIC AND GAS WELDING

Drawn Wire
TYPES 25, 43 and 52
Brazing 718

Aluminum Solder

White Metal

WELDING ALLOYS
MANUFACTURING CO.
744 Broad St., Newark 2, N. J.

MORTON OFFERINGS FOR JET ENGINE PROGRAMS

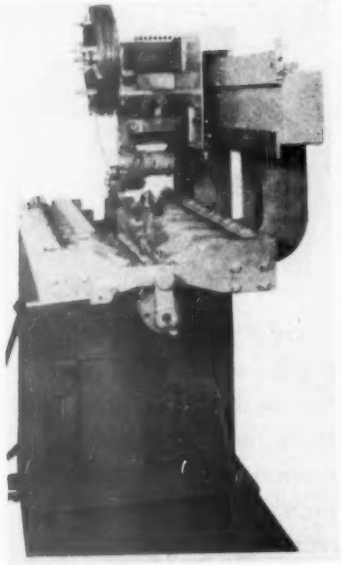


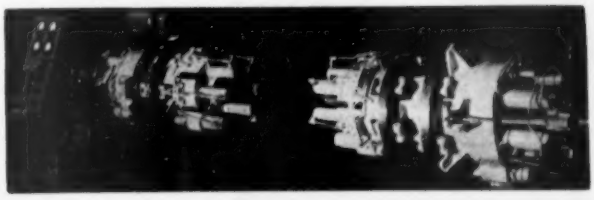
FIG. 3079 Bulletin 44-B

Shows our new design Model "A-3" Horn Type *Stake* Welder. The machine offers a new type of clamping arrangement advantageous for light gauge materials with no tendency for seam separation. The new design also offers less operator interference and better visibility through a more compact clamping design. At the same time this new design will include the features of all Morton Stake Welding Machines.

FIG. 2930, Bulletin No. 35-B

Morton 16" Stroke Heavy Duty Flash Trimmer Hydraulically Driven. It is arranged for flash and circular work having 9" minimum lower horn. It has 2" of operating distance between the dies and capacity for removal of flash of various alloys up to ¼" thick.

FIG. 3094-B



Morton Four Section Expanding Mandrel shown is designed to handle five separate shells and flanges and weld them into one component. Each section is under separate hydraulic control and expands a continuous back-up bar under each weld joint with approximately 10,000 lb. force available.

MORTON MANUFACTURING COMPANY, Muskegon Heights, Michigan

The Inquiring Weldor

BY JOHN WILSON

Question: Can you tell me about a "spectacular" welding job you've done recently – that you couldn't do years ago?

I. Kozemchak, Wilkes-Barre, Pa. At a cost of $24.05 for time and Eutectic's Xyron 2-24 I saved a $2300 Hall-Scott Horizontal Bus Motor Block for my corporation. We had been sending such jobs out to be welded by a specialist but since Eutectic products have become our standard welding rods we no longer send any welding jobs outside of our own shop. The careful guidance of Eutectic's field engineers and their extensive literature service makes this possible. Using pre-heating and post-heating, tacking and skip welding I got a solid mass weld. After careful and liquid pressure tests, the block was put into regular operation with complete satisfaction.

Question: What's your experience in replacing rivets with welding for automotive collision repair?

Joseph Wagner, Woodhaven, N. Y. We once used riveting for bus repair jobs like replacing an aluminum corner panel, with broken and bent corner post because high heat rods would build up stress and crack. By using Eutectic Low Temperature Welding Alloy #190 and 190 Flux, we welded a new panel in and saved considerable time and money—the coach was ready two days sooner than the old method of taking out rivets, cutting, fitting and riveting all over again.

Question: Are welding research and new products solving special maintenance welding problems such as overlaying for erosion resistance?

Louis Popa, Salt Lake City, Utah. The Eutectic research that developed EutecTrode 10 answers your question. At the large western refinery where I work, we recently greatly extended the life of the inside surface of the lines in a catalytic unit. The lines are exposed to gases, steam and flowing particles of silica-alumina—the temperature is up to 940 degrees with 25 psig line pressure. Using "No. 10" I laid weld beads down side by side. The "Low Heat" electrode kept base metal dilution to a minimum. We had no stresses, cross checking and completely protected the line wall from severe erosion.

Question: Can you prove that Non-fusion welding rods work with inert gas shielded arc welding?

Fred Heberling, Carmel, Ind. We solved an annoying situation – salvage of bronze castings—by using EutecRod 180 with that process. After all, heat is only temperature multiplied by time so even though the electric arc is 50% hotter than the oxy-acetylene flame there was actually less heat to worry about. I add the EutecRod #180 by flowing it out on the parent metal. The arc heat is concentrated—I move along at a good speed and get clean porous-free welds in less time. I know our salvage is being done for much less money than formerly and I'm making things easier for the machinists too. Ordinary fusion welding had sponginess and pin-holing—Non-fusion welding didn't and prevented discoloration, diminished our polishing costs.

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EUTECTIC LOW TEMPERATURE WELDING ALLOYS clear up welding headaches . . . minimize warping, distortion, stresses and embrittlement. For time and money saving help on welding steels, aluminum, cast iron . . . and all "problem" alloys at temperatures below base metal melting points . . . and for stronger, safer production and maintenance welding just write "Welding Data Bank" for your free copy of "1954 Welding Data File" on your jobs.
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40-40 172nd St. Flushing, N. Y.

ROBERT J. JOHNSON has joined the Pittsburgh technical section of the Development and Research Division, The International Nickel Co., Inc. He formerly was chief metallurgist for Round Chain Co., Cleveland.

* * *

EARL M. EVLETH recently retired as West Coast manager of The Bastian-Blessing Co., Chicago. He joined the company in 1925, after nine years' experience as an engineer in the manufacture of welding equipment. His first job with Bastian-Blessing was as an engineer in the firm's Grand Haven, Mich., plant, where he worked on the design and production of "RegO" acetylene generators. From 1929 to 1938, Mr. Evleth worked in the Chicago offices, designing welding and cutting equipment. He then left the company but returned in 1945.

* * *

AUSTIN F. LEACH has been named manager of product service for General Electric Co.'s Welding Department, York, Pa. He will be responsible for developing techniques to reduce maintenance, increasing availability of renewal parts and for general service to customers on all department products. With G-E since 1941, Mr. Leach joined the Welding Department as application engineer in 1943. He has also been a welding sales engineer and an electrode sales engineer for the department. His most recent job was manager of renewal parts.

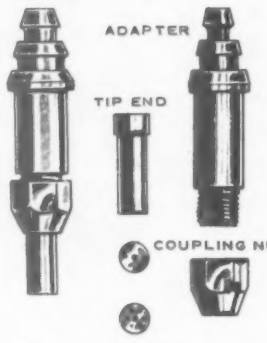
* * *

Two new sales zones—St. Louis and Central—have been formed by The Carborundum Co., Niagara Falls, N. Y. In charge of the St. Louis zone will be ROBERT J. MCCLURE. The Central zone, which covers Ohio and Michigan, will be under LEONARD C. MURPHY. Mr. McClure will make his headquarters in the St. Louis district sales office, Mr. Murphy in the Cleveland district sales office.

* * *

FRED W. MARTINSON and GERALD E. HART were recently promoted to welding engineers at Solar Aircraft Co., Des Moines, Iowa. Both are graduates of Iowa State College. They came to Solar as process engineers.

NEW ... CUTTING TIPS



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Weld with Wagner

JOHN M. DAVIDSON has been appointed assistant sales manager of the Metal Processing Department of Pennsylvania Salt Mfg. Co., Philadelphia.

* * *

H. L. WAGENER has been named special consultant to the research group of KSM Products, Inc., Merchantville, N. J. He will guide the development of new materials and processes in stud welding. Mr. Wagener had been with the New York Shipbuilding Corp. for more than 22 years. First projects in the KSM research program include evaluation of weld strengths between various metals and alloys, examination of machinability and weldability of steels used in manufacturing studs and development of methods, both destructive and non-destructive, for testing stud welds.

* * *

JOHN A. HILL, president of Air Reduction Co., Inc., New York City, recently gave an address before the Purchasing Agents Association of New York.

* * *

Three personnel changes have been announced by Lukens Steel Co., Coatesville, Pa. EDWARD J. CHARLTON, formerly manager of development engineering, has become manager of fabrication at the Lukenweld Division. He succeeds FRANK C. KARDEVAN, who has become a field sales engineer and will work particularly with Lukenweld products. WILLIAM H. FUNK, who had been assistant manager of development engineering, has become acting manager of the new-products development department.

* * *

Died

ALFRED C. LEIGH, 57, naval architect for the Ingalls Shipbuilding Corp., Pascagoula, Miss., died Feb. 21. He had been with the firm since 1934. He supervised the design of the original Ingalls all-welded "C-3" vessel, which subsequently was built in large numbers at the Pascagoula yard. Mr. Leigh was a member of the American Welding Society and the Society of Naval Architects and Marine Engineers. He was a veteran of World War I and served in France. Surviving are his widow and a daughter.

The Inquiring Weldor

BY JOHN WILSON

Question: What's your answer to the question of "replacement parts vs. salvage by welding?"

Harry Leack, Floral Park, L. I. In my transportation company, we must weld — can't afford not to. During the war we couldn't get the parts and so we adopted "Non-fusion" welding rods made by Eutectic that gave us a complete build-up suitable for machining in five minutes. Now, with high taxes, etc., we're glad we did. We still use EutecRod 185FC, for instance, to economically salvage parts which are subject to frictional wear. This Eutectic process of rapid repair of bus transmission, brake shafts and flanges has proven itself in our shop by many additional miles of service on the road.

Question: Have you found Non-fusion welding profitable for re-designing tools? ***Howard A. Hayden, Detroit, Mich.*** Using EutecRod 16 instead of a tipped high speed Fluteless Drill my Company uses for plastics led to a saving of 90 per cent. In addition, the drill we produced with the Eutectic Low Temperature Weldor Alloy looked better after our salt bath coloring operation and gave us a more saleable product. EutecRod 16 really adheres to carbides and develops a strength of 100,000 psi which matches well the yield figure of the shank material, carbon drill rod. The various sizes offered in this rod also helped simplify our work.

Question: What would you say the aircraft industry's main contribution to welding has been? ***H. W. Sandford, Elmwood, Conn.*** Recognizing that "Low Heat" Alloys make it possible to weld many commonly used metals, particularly aluminum alloys that were, not long ago, considered difficult to weld. Low temperature welding has revolutionized engineering and design. And the special triple-action fluxes developed for Eutectic Low Temperature Alloys best assure a high degree of quality control. Zinc base die castings are a graphic example. Without "Low Heat" materials their welding would be impossible. Eutectic Fluxes which visibly show when to weld at 100 to 200 degrees below destructive heats of ordinary rods make this job possible.

Question: What contribution has "Low Amp" aluminum welding made to industrial research? ***W. T. Bishop, Chicago, Ill.*** Using Eutectic Low Temperature Welding Alloys we have been able to eliminate the costly, time consuming wood pattern, casting, machining and assembly previously repaired for models of new products. Fusion welding would not do the job due to high heat and parent metal distortion. Tests showed Non-Fusion welding results were phenomenal and beyond all expectations. When we needed a deep draw aluminum can of thin gage material we made a block, formed the can around it and welded the seams with a patented Eutectic thin flowing alloy. The weld was so neat that parting lines were invisible—extruding and coining operations failed to break the weld. "Low Temperature" aluminum welding with its new advances is definitely to be recognized as a process needed in industrial research.

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EUTECTIC LOW TEMPERATURE WELDING ALLOYS clear up welding headaches . . . minimize warping, distortion, stresses and embrittlement. For time and money saving help on welding steels, aluminum, cast iron . . . and all "problem" alloys at temperatures below base metal melting points . . . and for stronger, safer production and maintenance welding just write "Welding Data Bank" for your free copy of "1954 Welding Data File" on your jobs.
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Whatever the emergency is, everybody's going to want help at the same time. It may be hours before outside help reaches you. The best chance of survival for you and your workers—and the fastest way to get back into production—is to know what to do and be ready to do it. Disaster may happen TOMORROW. Take these simple precautions TODAY:

☐ **Call your local** Civil Defense Director. He'll help you set up a plan for your offices and plant—a plan that's safer, because it's integrated with community Civil Defense action.

☐ **Check contents** and locations of first-aid kits. Be sure they're adequate and up to date. Here, again, your CD Director can help. He'll advise you on supplies needed for injuries due to blast, radiation, etc.

☐ **Encourage personnel** to attend Red Cross First-Aid Training Courses. They may save your life.

☐ **Encourage your staff** and your community to have their homes prepared. Run ads in your plant paper, in local newspapers, over TV and radio, on bulletin boards. Your CD Director can show you ads and official CD films or literature that you can sponsor locally. Set the standard of preparedness in your plant city. There's no better way of building prestige and good community relations—and no greater way of helping America.

Act now . . . check off these four simple points . . . before it's too late.

Layout of Pipe

PIPE WELDING LAYOUT. By Dorsey B. Thomas. Published by D. B. Thomas, Savannah, Ga., 1953. Paper, 4 by 6⅜ in., 87 pages. Price $1.50.

This concise pocket-size manual was prepared for the purpose of simplifying pipe layout work for field welding. Both the simplified and template methods of layout are outlined in detail, and all types of applications are described and discussed. The author recommends the use of the simplified method when it is desired to lay out only one joint and when the design and use of templates would not be economical or practical. Templates are recommended when the layout of more than one joint is necessary.

The layout of 90-deg turns, full-size and reducing tees, branch lines, reducing laterals, laterals on a tangent, Y joint, concentric reducers, eccentric reducers and bull plugs are covered. Also included are tables covering standard pipe dimensions, slip-on flanges, common fractions and areas and volumes.

• • •

Repair Welding of Iron

RECOMMENDED PRACTICES FOR REPAIR WELDING OF CAST IRON PIPE, VALVES AND FITTINGS. Published by the American Welding Society, New York, 1954. Paper, 6 by 9 in., 12 pages. Price 50 cents.

The use of welding in repairing gray iron, white iron, chilled cast iron, malleable iron, alloy cast iron and nodular cast iron is covered by this American Welding Society booklet. It not only suggests how to prepare the castings for welding, veeing, preheating, etc., but also tells what postweld heat treatments are required under various welding conditions.

Welding procedures are given for the following processes: arc welding with nickel electrodes, mild-steel electrodes, cast-iron electrodes or copper-base electrodes; carbon-arc welding; oxyacetylene welding and braze welding.

While the material presented has been written specifically for pipe valves and fittings, it is equally applicable to all castings.

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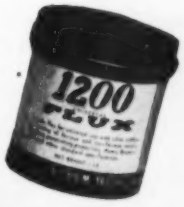

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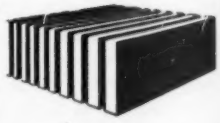

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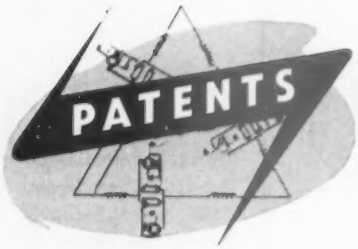
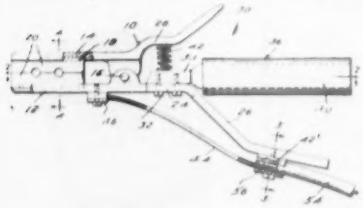


Electrode Holder

2,658,133. James R. Barrow, Columbiana, O. Assigned to Columbiana Boiler Co., Columbiana, O. Filed July 28, 1950. Granted Nov. 3, 1953.



This patent refers to a holder for welding electrodes. A pair of parallel jaws is pivoted together adjacent the inner ends. The jaws have operating hand grips that project to the rear from these inner ends. A shank extends to the rear with one jaw and is in line with it. On the shank is a hand grip of insulating material. A coil spring is interposed between the connected end of the shank and the extension of the other jaw to maintain both jaws in electrode gripping relation. The extension of the lower jaw is longer than that of the upper. A clamp to secure the bared end of an electrical conductor is mounted on the outer side of the lower jaw. Another clamp is mounted on the extension of this same jaw to support the insulated portion of the conductor.

* * *

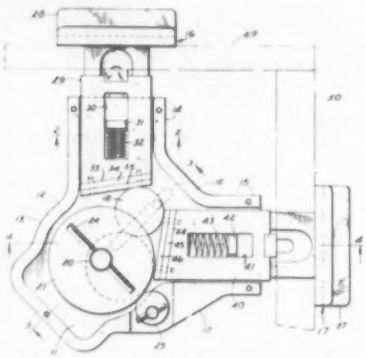
Coated Electrode

2,664,488. Rene-Jacques Mouton, Uccle, Belgium. Assigned to Soudometal Societe Anonyme, Forest-lez-Bruxelles, Belgium. Filed Aug. 14, 1950. Granted Dec. 29, 1953.

This is a newly patented steel-core electrode that is coated. When dry, the coating has an outside diameter between 1.7 and 2.3 times the diameter of the core. Its composition is such that when heated in air for an hour at a temperature of from 850 to 950 F, it is subject to a 5-to-30% weight loss. The coating contains silica, titanium dioxide and a substance taken from a group consisting of lime and magnesium oxide. The last-named ingredient is present in such quantity that the ratio by weight is above 13.

Welding Vise

2,660,141. James G. Thomas, Cleveland. Filed Feb. 23, 1950. Granted Nov. 24, 1953.



The body of this newly patented welding fixture has two fixed jaws attached to it. The jaws are at an angle to each other. Spring retractable jaws are mounted in the body and complement the fixed jaws to form vises. Each of the retractable jaws has a bearing surface at its inner end, thus forming an acute angle to a line of symmetry between the jaws. A circular sliding cam engages the bearing surfaces, and a rotating driver cam engages the sliding cam. A pin projects from the sliding cam into a groove in the body of the fixture. This confines the cam's movement. Rotation of the driver cam thus produces a sliding motion of each jaw, regardless of the position of the other jaw.

* * *

Solder Flux for Tungsten

2,658,013. Wilson H. Hannahs, Westbury, N. Y. Assigned to Sylvania Electric Products Inc. Filed June 28, 1949. Granted Nov. 3, 1953.

A flux suitable for the hard soldering of tungsten is covered by this patent. The flux consists essentially of a mixture of approximately 11 parts by weight of potassium tetraborate, 47 parts by weight of boric acid, 35 parts by weight of water and seven parts by weight of powdered iron.

* * *

Non-Fusion Welding

2,664,622. Karl Spitz, Cleveland. Filed March 2, 1950. Granted Jan. 5, 1954.

This is a newly patented method for effecting the non-fusion weld of a base metal by means of a steel rod. The base metal is selected from the group comprising ferrous metals and brazable non-ferrous metals. It is preheated to an elevated temperature that is below its solidus. The steel weld metal is melted and deposited in the weld zone to produce a bonding temperature of the base metal, which is below its solidus. At the same time, molten low-melting eutectiferous phase-forming elements are introduced into the zone in sufficient quantity to create an intermediate alloy phase, which has an affinity for the base and weld metals. It also has surface tension reducing elements that increase the fluidity of the latter. The bonding temperature of the base metal is maintained until the weld is completed.

* * *

Iron Brazing

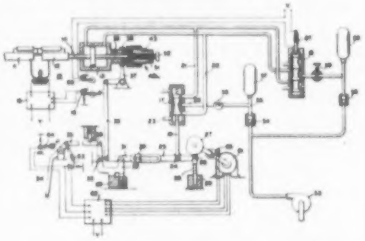
2,661,282. Bernard A. Daley, Scott Township, Vanderburgh County, Ind. Assigned to Servel, Inc., New York City. Filed Oct. 28, 1949. Granted Dec. 1, 1953.

This patent covers a powdered alloy of iron and phosphorus. The phosphorus content is greater than that in a eutectic proportion. The quantity of powdered iron is such that the relation of iron and phosphorus in the whole mixture is substantially a eutectic proportion. The mixture is compacted to a form that can be applied as brazing material to a joint between iron parts.

* * *

Resistance-Welder Control

2,665,360. Hans H. Hansen, Warren, Ohio. Assigned to The Taylor-Winfield Corp., Warren. Filed March 14, 1952. Granted Jan. 5, 1954.



A hydraulic-control system for a flash-butt welder is the subject of this patent. The welder has a movable platen and a hydraulic cylinder connected to the platen. The cylinder moves the platen and a valve which controls the flow of hydraulic fluid under pressure to the cylinder. This advances the platen through an initial flashing range of movement. A second valve furnishes fluid to the cylinder to advance the platen through a further or upset stage of movement. A differential mechanical linkage actuates the first valve.

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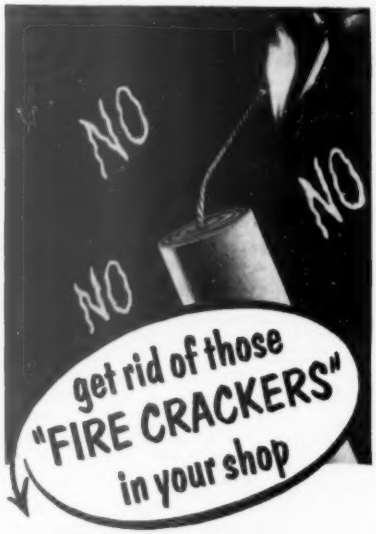

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30 YEARS AGO

(Taken from THE WELDING ENGINEER *of April, 1924)*

AN article in this issue entitled "Some Chemical Aspects of Welding" by J. R. Booer discusses the principles of oxidation and reduction. It also tells how chemical changes produce great differences in properties and composition.

—30 YEARS AGO—

"WELDING World History" is the title of a pamphlet recently issued by the Purox Co., Denver, illustrating the welding operations performed on the United States airships which started their around-the-world flight on March 17.

—30 YEARS AGO—

WELDING exhibits were a prominent part of the 16th annual show of the National Railway Appliances Association, which was held March 10-13 at the Chicago Coliseum.

—30 YEARS AGO—

NEWLY elected secretary and general manager of Buckeye Oxygen Co., Canton, Ohio, is Philip G. Wesley. The firm recently placed into operation a new oxygen plant with a monthly capacity of 2,000,000 cu ft.

—30 YEARS AGO—

DAVID AHLDIN, formerly chief engineer of the Commercial Acetylene Supply Co., New York, recently became associated with M. Keith Dunham, Chicago.

—30 YEARS AGO—

A NEW building, part of which is to be used for a welding shop, is being constructed by the Salt City Welding and Machine Shop, Hutchinson, Kan.

—30 YEARS AGO—

THE Central Welding Co., Lansing, Mich., is planning to build a larger plant and install addiitonal equipment in a new location at Turner and Howard Sts.

—30 YEARS AGO—

A NEW oxyacetylene plant has been completed at the Sacramento, Calif., shops of the Southern Pacific Co.

—30 YEARS AGO—

E. L. MILLS, sales manager of The Bastian-Blessing Co., Chicago, recently returned from an extensive business trip through the Southwest.

—30 YEARS AGO—

THE firm of Gustafson & Swanson has taken over the welding shop at 1121 N. Ashland Ave., Chicago, formerly operated by Ebright & Luthy.

ALLOYS
All-State
FLUXES

WE'VE GOT TIME ANYTIME TO TRY TO SOLVE YOUR PROBLEM

Welding people have been tossing problems to us for years now. We like it. And, we've successfully found good answers to so many of them that today we can offer you off the shelf:

The world's most complete line of alloys and fluxes for aluminum,

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12 for copper, brass, etc.,

8 for stainless steel,

12 for steel,

Many other alloys and fluxes for magnesium, nickel, zinc-base die cast, tinning, galvanizing, cutting, bevelling, and chamfering

Chances are that we can give you your answer quickly.

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Showed me how to join nichrome to copper.
Made me the world's strongest soft solder.
Gave me an electrode a beginner can use.
Showed me how to repair heat treated parts without spoiling the temper.

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249-55 FERRIS AVE., WHITE PLAINS, NEW YORK

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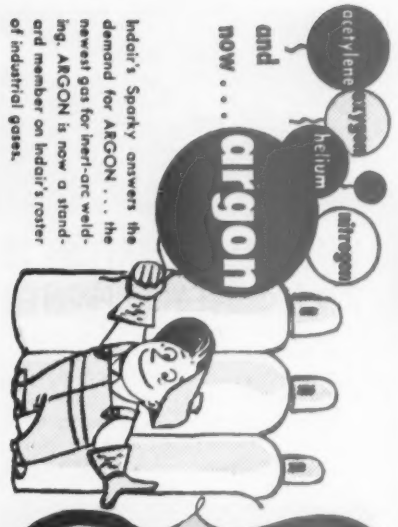
BOOTH 63, WELDING SHOW



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PORTLAND, ORE.
MEDFORD, ORE.
SPOKANE, WASH.
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INDUSTRIAL AIR PRODUCTS OF THE SOUTH
NEW ORLEANS, LA.

When You Weld Cast Iron Select the Correct

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FUSE-WELL NO. 11

FUSE-WELL No. 11, *Square*—Gray Cast Iron Welding Rod for Acetylene use in filling or building up new or worn castings producing machineable welds.

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FUSE-WELL No. 22, *Electrode* — Light coated Rod to be used for AC or DC welding in the fabricating and repairing of cast iron castings.

Sold through Leading Distributors

THE CHICAGO HARDWARE FOUNDRY CO.
Weld Rod Division
NORTH CHICAGO, ILLINOIS

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SOLDERING
BRAZING & WELDING
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SEARCHLIGHT SECTION

(Classified Advertising)

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An Advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

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RESEARCH ENGINEER WANTED

for midwestern Electrode manufacturer. Metallurgical background as well as experience in Arc Welding Electrode coating Desirable.

WRITE BOX P2103 WELDING ENGINEER
330 W. 42nd Street, New York 36, N. Y.

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New NO-FOG Cleaning Tissues

Used by Welding & Industrial Firms. Write for FREE Samples.

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PRACTICAL WELDING ENGINEER AVAILABLE IN JULY. 15 years' experience ranging through all processes from aircraft to hydro-electric installations, including South American service, sales, expediting and teaching.

PW 2005, WELDING ENGINEER
330 West 42nd Street
New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

OXYGEN & ACETYLENE plant superintendent to supervise several plants of a major oxygen producer. Graduate engineer preferred. State experience, age and background in industry. Replies held confidential. Top salary. P-2068, Welding Engineer.

POSITION OPEN for man with knowledge of heavy maintenance welding and fabrication of weldments, etc. Also experience in estimating and management of shop in large eastern city. Give complete information, age, salary, etc. Good opportunity for right man. Box P-2137, Welding Engineer.

SELLING OPPORTUNITIES OFFERED

REGIONAL SALES Manager—This definitely is a bigger opportunity than one which would have you start at the bottom. Yet, from this Regional Sales Managership, you still can write a further ticket for advancement. Hence, man selected by this national concern must have prior experience in management to take care of several states in which distribution is established, and be capable of demonstrating and selling welding alloys. Reply in confidence giving full experience and educational background. If available, send picture. Interview to follow. All our people know of this advertisement. SW-1653, Welding Engineer.

WANTED: REPRESENTATIVE for gas welding and cutting equipment, to call on large steel mills and railroads. Good commissions on repeat business. Other lines permissable. Write letter stating qualifications to Box RW-1874, Welding Engineer.

WANTED: MANUFACTURERS agent to call on welding supply jobbers. Nationally advertised line. Many territories well developed. Most territories open. Good comm. Write stating territory covered and present products handled. Expendable product with large repeat orders. Write Box RW-1873, Welding Engineer.

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WE TEACH . . . .

Electric Arc Welding, Oxy-Acetylene Welding, Heliarc Gas Welding, Spot Welding

Maintenance and repair of all kinds of Welding Machines

COLLINS TRADE SCHOOL
575 Atlantic Ave., Brooklyn 17, N. Y.
TRiangle 5-1070

SCHOOL

WELDING—A profitable trade. Demand for trained men. Learn quickly at best equipped school in U. S. Non-profit. G.I. approved. Catalog free. Write Hobart Welding School, Box U-441, Troy, Ohio.

BUSINESS OPPORTUNITIES

Illness forces sale of well established Welding Shop in Albany, New York. Good equipment and location. Available with or without real estate. J. Ainsworth Scott, 227 Lark Street, Albany, New York.

Welding & Steel Fabrication shop near San Bernardino, Calif., on Highway 99. Modern steel shop bldg. 60' x 70' also attractive 2 bedroom houses. Price $13,500.00—$4000.00 down payment and balance on terms. Write to J. R. Gebble, Rt. 1, Box 278, Loma Linda, Calif., Ph. 63151.

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Do you have sufficient business in your area to support the production of 180 standard 244 cubic foot cylinders of oxygen every 24 hours?

★ We have a plant, bought less than four years ago, that will produce this quantity of oxygen.

★ We will train one or more of your men to operate this plant.

★ We have a complete acetylene plant for sale, also, and we would assist your man in the procedures of compressing acetylene with this plant and producing approximately 100,000 cubic feet of acetylene each month on a 60-hour weekly operation. Write:

J. ERNEST STROUD
211-213 BUCHANAN STREET
AMARILLO, TEXAS

12—Linde Automatic Union Melt, Mdl U.M. machines, complete with Heads, Control Boxes, Wire Reels and Travel Carriages—reconditioned and guaranteed ..... $900.00 each
1—G.E. Automatic Welding Machine, Auto. Welding Head and Control Box, new..... $700.00
8—500 Amp AC Welding Machines, reconditioned and guaranteed ..... $325.00 each

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PORTABLE GRINDERS

Special Bargain: 3—Heavy duty 6" Thor Portable grinders with 6" wheels. Silver Line in original cartons. Sells for $112.00—your cost, $70.00 each.

M. C. SOLON
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FOR SALE

400 AMPERE LINCOLN WELDERS

Type SAE 40 volts DC with DC control.
Drive 220/440 volts, 60 cycle, 3 phase.

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109 Church Street Buffalo 2, New York

LINCOLN
SEMI-AUTOMATIC WELDERS

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STERLING WELDING EQUIPMENT CO.

SPOT AND ARC WELDERS

Rentals or Sales basis

NEW USED

DEALERS INVITED

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IF THERE IS
Anything you want
that other readers of this paper can supply

OR—

Something you don't want
that other readers can use, advertise it in the

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250 Oxygen Cylinders, 150 cu. ft., new, round bottom. ICC-3A-1800—$18.50 each.
150 Oxygen Cylinders, 40 cu. ft., round bottom, new. ICC-3A—$9.50 each
300 CO^2 Cylinder, 5 lb., round bottom, new. ICC-3A1800—$6.00 each
2 OXYGEN PLANTS, Independent, O2-B, new, 600 cu. ft. per hour, 20-25 meters, complete less power unit—$4,500.00 each
1 OXYGEN PLANT, same as above but trailer skid mounted—$5,000.00 each
1 ACETYLENE PLANT, Linde, used, 500 cu. ft. per hour, complete, ready to run, excellent shape—$5,000.00
1 OXYGEN PLANT, Air Products, 600 cu. ft. per hour, complete, liquid pump type, used slightly but completely overhauled by factory—$8,500.00
15 Kiddie Type 2 Wheel Trailer Fire Extinguishers pith 6 each 50 lb. and 2 each 15 lb. CO^2 fire ext. and 90 ft. hose. Complete, never used—$395.00 each
1 O2-B Oxygen Column Only, 1,000 cu. ft. per hour capacity. $1,800.00
1 Nordberg Air Compressor, 1000 PSI, 5000 cu. ft. per hour, run less than 100 hours—$2,500.00
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4 Each Independent oxygen plant expansion engines

DYE OXYGEN COMPANY, INC., Mfrs.
3332 W. McDowell Rd., Phoenix, Ariz.

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Size	Type	Quantity
1/8	McKay 308 Mo	1000
5/32	P and H 308 Mo	3000
3/32	Page 308 Mo	800
1/8	G. E. 309	500
3/16	P&H, 307, 19-9Mn	5000
5/16	G.E. 308 Mo	4000
5/16	G.E. 307, 19-9Mn	7500
1/8, 5/32	Monel 130-X	2000
1/4	Coast Metal #112	300
3/32, 1/8	Inconel 132	200

LESCO PRODUCTS CO.
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250 Amp Hobart Pipeliners, 1953 models just a few months old, condition perfect, available at 25% off new price, will take trade-ins.

H. K. MILLER, INC.
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Phone HUdson 3-5640

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G.E., 400 Amp., Model 6WD34C2, 220/440/3/60, excellent condition.
Price, f.o.b. Cleveland, Ohio, $225.00 each

WEBER MACHINERY CO.
8200 Bessemer Ave., Cleveland 27, Ohio

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AMPCO-TRODE, 3/16" x 14" No. 10 Aluminum Bronze Coated D.C. Electrodes in Good Condition—25 lb. Cartons—50c lb.

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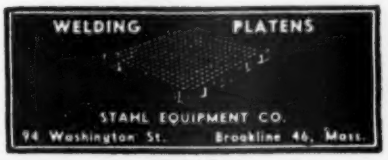
ZAKROFF MACHINERY CO.
249 N. Third Street, Philadelphia 6, Penna.
Market 7-1540



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DUAL-LINE WELDING HOSE

- One Piece Construction
- Strong, Braided Cords
- Tough, Abrasion-Resistant Cover
- Long-Lasting, Non-Flake Tubes
- Heavy Brass, Factory-Coupled Ends

3/16" I.D.		¼" I.D.	
25 Ft.	50 Ft.	25 Ft.	50 Ft.
$5.95	$10.65	$6.75	$12.40

Prices Net—Delivered on 100' or more. On less add 35c per 25'—70c per 50'. Net 10 Days—All Others M. O. or Cash With Order.

THIS HOSE IS NOT SURPLUS OR SECONDS— ABSOLUTELY FIRST GRADE

Approved by National Bureau of Fire Underwriters (NBFU) and International Acetylene Association (IAA)

ORDER NOW ! ! !

SAXON RUBBER CO. Dept. T

438 Larimer St., Denver 4, Colo.
Write for Prices on Bulk Quantities

NEW METALLIZING GUN

1 only Type Y Metco Metallizing Gun
1 Type 2H Metco Hose Unit
1 Type 2A Metco Air Control Unit
1 Type GF Metco Flow Meter Unit
1 Type X Metco Rotary Shaft Tool
1 Type 2W Metco Wire Control Unit

Original Cost $1,225.00
Will Sacrifice at $850.00 entire Unit
Used only for demonstration for less than three days.
Also available 750 lbs. of 1/8" Zinc Metal Spray Wire and 1750 lbs. of 3/16" Zinc Metal Spray Wire.
Will sell the wire at 25c a lb.
All items f.o.b. Portland subject to prior sale.

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Linde (Unionmelt) Continuous Automatic arc welding heads & controls (1) w/carriage & controls
Geweco, Flame cutting machine, Model A-63 w/5'x14' table, complete machine

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Vo-2-4830

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SEAM WELDER, Progressive, 150 KVA, New.
SPOT WELDER, National, 40 KVA, Used.
CUTTING TORCHES, Used, Oxweld, Airco, Harris.
WELDING TORCHES, New, Rego GV.
BRONZE—STAINLESS—AMPCOTRODES.
NO. 12 LENSES, ELECTRODE HOLDERS.
RALL SUPPLY CO. 6 E. 39th St., NYC 16

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Why People Buy
TWECOTONG
Electrode Holders

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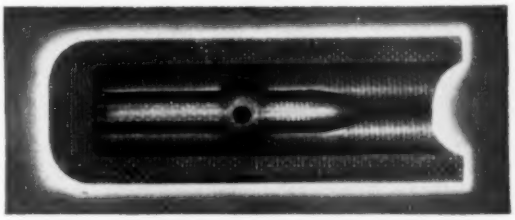
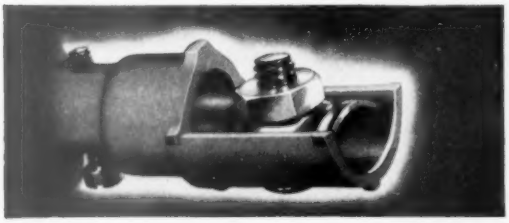
Patented "Super-Mel" laminated glass cloth insulation (30 layers), exclusive to TWECOTONG, is internally-keyed to the holder casting. Won't shift, won't break, won't burn. All top and bottom jaw tip insulation interchanges.





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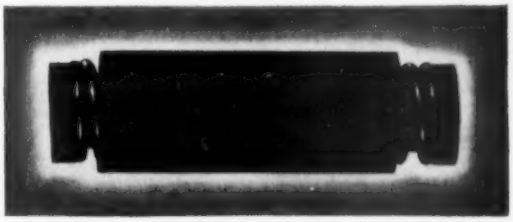
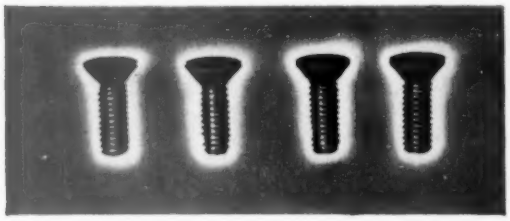
Only one part to buy. Heavy fibre washers pressed into the ends of the spring insulate it from the holder. Heat and oil resistant Neoprene sleeve keeps spatter, dirt and corrosion out of spring. No meshing spring cups to bind, or clog, or break.





4. JUST 4 SIMPLE SCREWDRIVER SCREWS

All you need is a screwdriver and a Crescent wrench to maintain TWECOTONG. All insulation is installed with only 4 identical slotted screws. No need to hunt for Allen wrenches or other special tools when you use TWECOTONG Holders.

TWECOTONG Holders are made in six Rod-Rated models, each designed to handle several different rod sizes. Uniform design permits interchange of parts in many models — simplifies your stocking problem. Call your local supplier for a demonstration ••• put one of these cost-cutting holders on trial in your plant. You'll be glad you did!

$5.50
10 TO 25% LESS IN QUANTITY

350 AMPERE
MODEL A-14 TWECOTONG

SEE YOUR LOCAL WELDING SUPPLY DISTRIBUTOR

WRITE FOR TWECOLOG
Data and prices on the complete TWECO line of electrode holders, ground clamps and cable connections.

Tweco
MANUFACTURERS OF ELECTRODE HOLDERS • GROUND CLAMPS • CABLE CONNECTIONS FOR ELECTRIC WELDING
PRODUCTS COMPANY
BOSTON AT MOSLEY • WICHITA, KANSAS, U.S.A.

Outstanding physicals recommend the A. O. Smith SW-65

low-hydrogen electrode

Here is a picture of an all weld metal .505 of the A. O. Smith SW-65 low-hydrogen electrode. Remarkable strength, superior ductility and exceptional elongation put this electrode in a class by itself.

Nominally an E6016 electrode, it far exceeds A.W.S. specifications for this class. It is used in many applications as an E7016 because of its superior physicals.

Its better manipulation, lack of spatter, easy re-strike, quick cleaning slag and fine appearing bead make it an operator's favorite from the very first trial.

With SW-65, you have the exceptional electrode for welding cold-rolled steel, re-rolled rail, high carbon, sulphur, selenium bearing steels and steels of poor weldability.

This is the electrode to use with confidence whenever there is any doubt about weldability, and where you desire high physical and x-ray quality.

May we suggest that you write us or contact your local A. O. Smith distributor for full details and a chance to test this remarkable low-hydrogen electrode.

A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION, MILWAUKEE 1, WISCONSIN

INTERNATIONAL DIVISION: MILWAUKEE 1, WISCONSIN